MOYSINIE SL
MÉTODOS DE OPTIMIZACIÓN Y SOLUCIONES DE INGENIERÍA

Moysinie Ver. 2.0.3

User Manual

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General

Moysinie is software specialized in the steel reinforcement solutions for the construction industry.

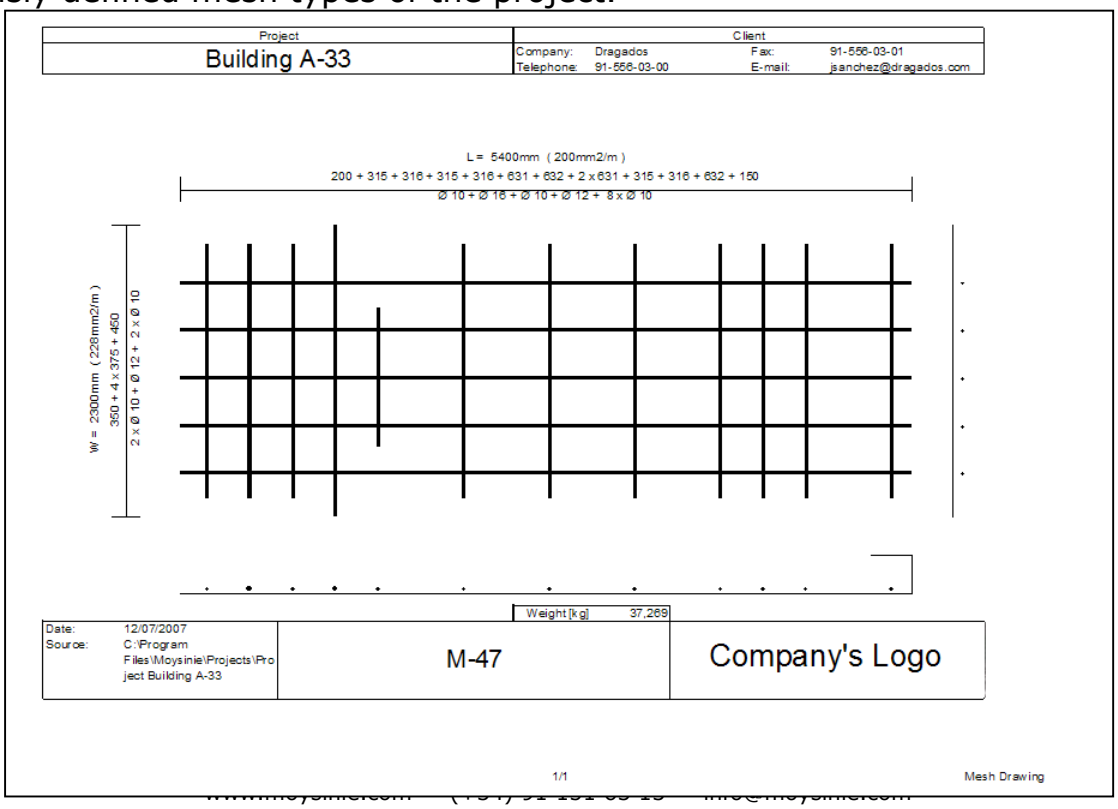
The program performs the calculations mutually with the automatic generations of all interrelated drawings and tables, working out the following outcomes:

Optimal Mesh

The program is looking for the mesh, that will cover all zones (areas) with the minimum of reinforcement steel. In other words, one mesh is to be chosen for all the zones we have been optimising.
Evidently, presuming the same total number of zones, the result of a realisation of more individual optimisations with less zones per process, is better concerning the weight (is less), and poorer concerning the number of different types of meshes (is greater). That because in principle, a different mesh will be chosen for each different optimisation.
Therefore a distinct criteria will be chosen depending on the program user: e.g. in case of a designer or a contractor, more independent optimisation processes will be applied than if the user is a mesh producer.

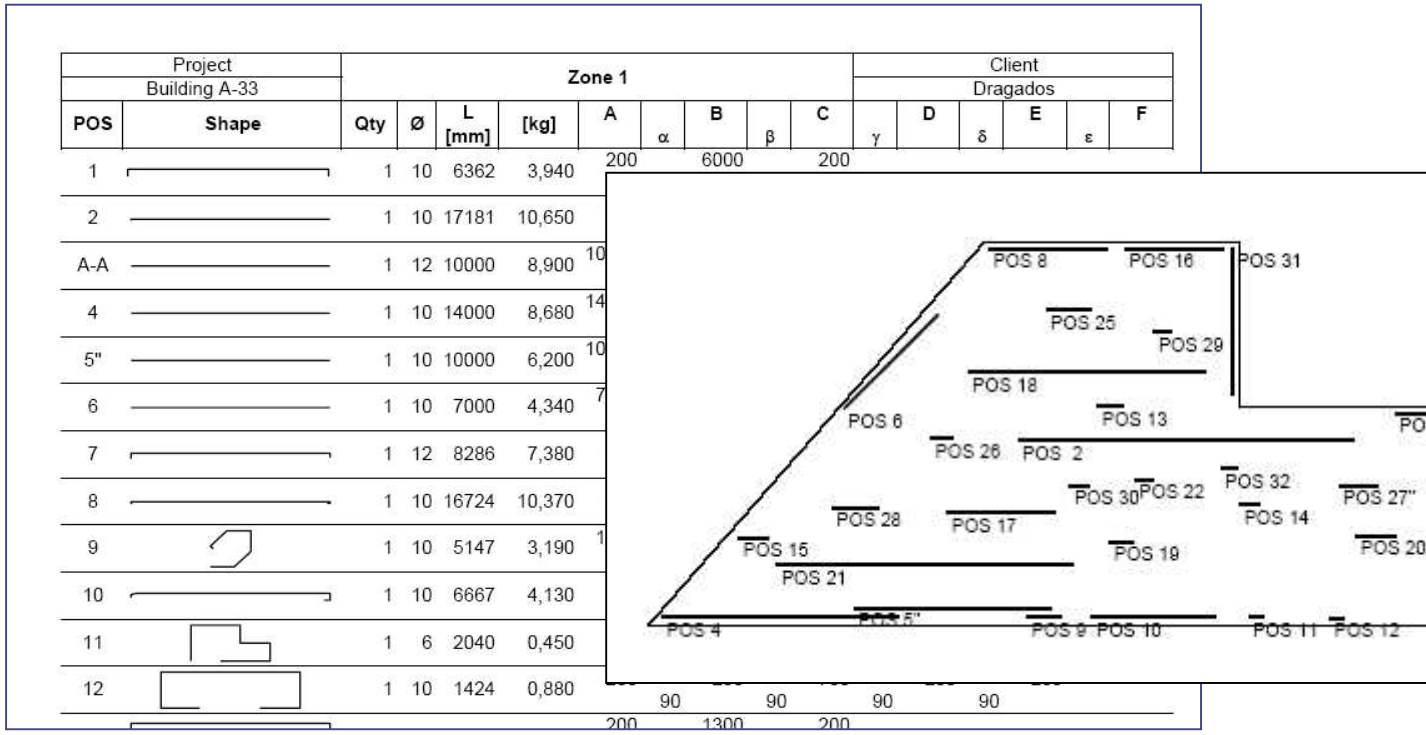
Optimal Pre-defined Mesh

When the process of the mesh optimisation explained above is limited to the previously defined mesh types of the project.


Project
Building A-33
Client
Company: Dragados
Telephone: 91-556-03-00
Fax: 91-556-03-01
E-mail: jsanchez@dragados.com
L = 5400mm (200mm2/m)
200 + 315 + 316 + 315 + 316 + 631 + 632 + 2 x 631 + 315 + 316 + 632 + 150
Ø 10 + Ø 16 + Ø 10 + Ø 12 + 8 x Ø 10
W = 2300mm (226mm2/m)
350 + 4 x 375 + 450
2 x Ø 10 + Ø 12 + 2 x Ø 10
Weight [kg] 37,269
Date: 12/07/2007
Source: C:\Program Files\Moysinie\Projects\Project Building A-33
M-47
Company's Logo
1/1
Mesh Drawing

Additional Reinforcement

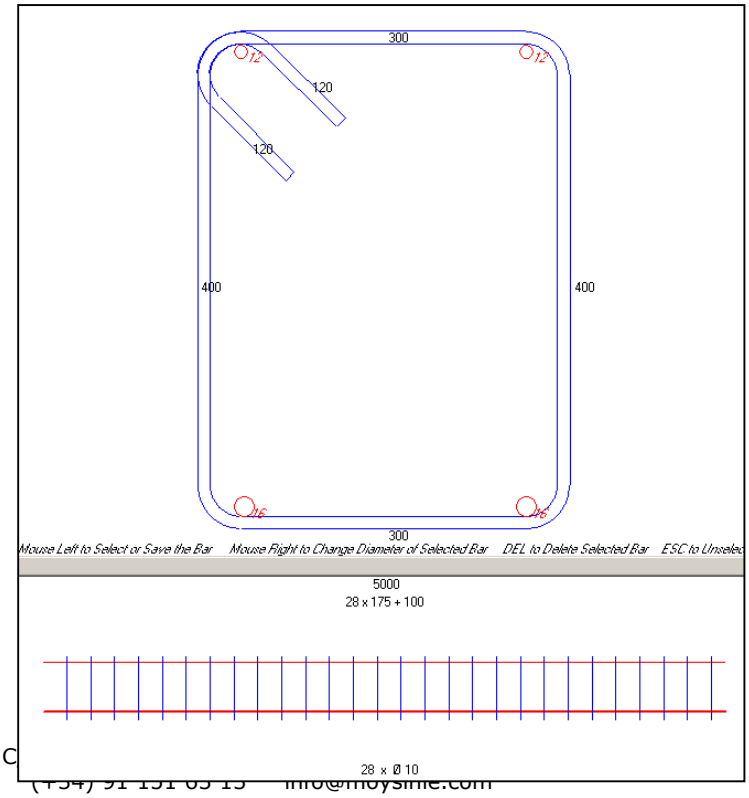
Possibility to introduce the bending schedule of the additional (loose) rebars for each zone. Optionally, each bar can be drawn and marked on the zone layout drawing.



Project: Building A-33		Zone 1										Client: Dragados					
POS	Shape	Qty	Ø	L [mm]	[kg]	A	α	B	β	C	γ	D	δ	E	ε	F
1		1	10	6362	3,940	200		6000		200						
2		1	10	17181	10,650											
A-A		1	12	10000	8,900											
4		1	10	14000	8,680											
5"		1	10	10000	6,200											
6		1	10	7000	4,340											
7		1	12	8286	7,380											
8		1	10	16724	10,370											
9		1	10	5147	3,190											
10		1	10	6667	4,130											
11		1	6	2040	0,450											
12		1	10	1424	0,880											
						200	90	1300	90	200	90		90			

Bent Mesh Based Elements

When some elements, such as beams or columns, are to be produced as a result of a mesh bending.



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Traditional Solution

The program calculates the weight of a traditional solution per zone, per direction, and the total weight, generates bending schedules with the exact rebar location, quantity, bar size, length, shape code, segment lengths and weight.

Project			Zone 2			Client		
Building A-33						Dragados		
Bending Schedule Traditional								3.401
POS (X / Y) [cm]	Quantity	Diam [mm]	Length [cm]	Bar Shape	A [cm]	B [cm]	C [cm]	Weight [kg]
25	1	10	50	100	50	0	0	0,31
45	1	10	98	100	98	0	0	0,61
65	1	10	146	100	146	0	0	0,9
85	1	10	194	100	194	0	0	1,2
105	1	10	242	100	242	0	0	1,5
125	1	10	290	100	290	0	0	1,8
145	1	10	338	100	338	0	0	2,1
165	1	10	386	100	386	0	0	2,39
185	1	10	434	100	434	0	0	2,69
205	1	10	482	100	482	0	0	2,99
225	1	10	530	100	530	0	0	3,29
245	1	10	578	100	578	0	0	3,58
265	1	10	626	100	626	0	0	3,88
285	1	10	674	100	674	0	0	4,18
305	1	10	722	100	722	0	0	4,48
325	1	10	770	100	770	0	0	4,77
345	1	10	818	100	818	0	0	5,07
365	1	10	866	100	866	0	0	5,37
385	1	10	914	100	914	0	0	5,67
405	1	10	962	100	962	0	0	5,96
425	1	10	1010	100	1010	0	0	6,26
445	1	10	1058	100	1058	0	0	6,56
465	1	10	1106	100	1106	0	0	6,86
485	1	10	1154	100	1154	0	0	7,16

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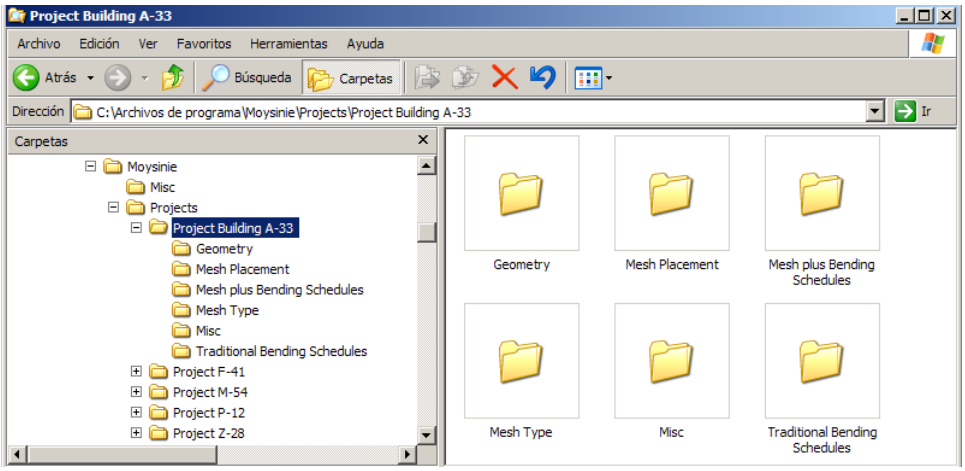
1. *Project* Based Hierarchy

All the calculations are associated to the Project and the results and drawings are saved in the correspondent Project's directory.



Any change of the project can be performed in any time.
After the project selection, pressing the button **Project Edit**, the widow of the zones' introduction will be opened, where the new zone can be added or previously selected zone deleted.
From this window, pressing the **Mesh & Traditional Solution** button, the program will proceed to the optimization process, and pressing the **Mesh Edit** button will leave to the pre-defined mesh types edition.

2. Zone input

The number of zones per project is not limited.
The zones' introducing can be executed in any time - the new zone can be added in the project by drawing, or importing from *AutoCAD*.

3. The zones' drawing

The drawing of the zone is very simple and intuitive.
To draw the new zone press the button **Draw Next Zone**.
The new window will appear, to introduce the number of the same zones ("1" by default) and the zone's name ("Zone i" by default).

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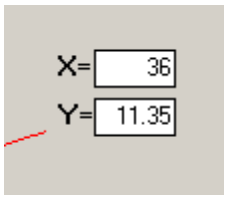
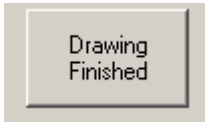
The lines (zone's limits) are orthogonal by default. Pressing the functional key **F8**, the introducing is being changed from orthogonal to non-orthogonal and vice verse.
During the zone drawing, when the mouse is being moving, the co-ordinates (in meters) are being changing as integer numbers. However, the number (with decimals) can be modified manually – first, press the **TAB** key until the co-ordinate is selected (marked in blue), then introduce the new value.



When the co-ordinate is correct, the line will be drawn by pressing the **ENTER** key, or the **Left Mouse** button.

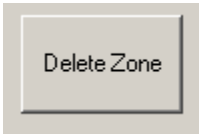
To undo the line drawing, press the **Right Mouse** button.

The zone drawing must be finished by CLOSING the polygon (zone's border). The last line that connects the last and the first point, should be drawn by pressing simultaneously **SHIFT key and Left Mouse** button. So, when the last point of the polygon (zone) is drawn, press SHIFT + Left Mouse button to draw the last line, i.e., to close the polygon. After closing the zone (polygon), the eventual hole in the zone can be drawn - the co-ordinates X and Y of a first point are shown; by pressing the Left Mouse button, the line is starting to be drawn. Again, the hole must be closed in the same way, pressing simultaneously SHIFT and Left Mouse button.



To accept the drawing, press the button **Drawing Finished**.

To delete the zone in any moment, press the **Delete Zone** button.

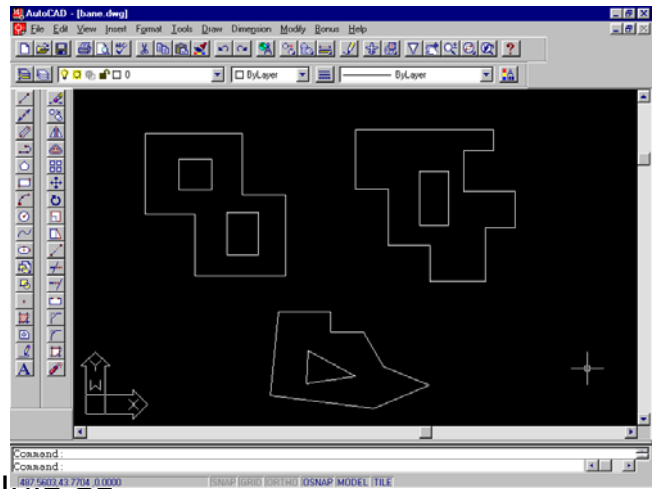


4. Zones import from *AutoCAD*

In any moment, any number of new zones can be imported from *AutoCAD*.

Between this and the next green line, all the screens are from the application *AutoCad*.

Zones are drawn or the existing *AutoCAD* drawing is opened:



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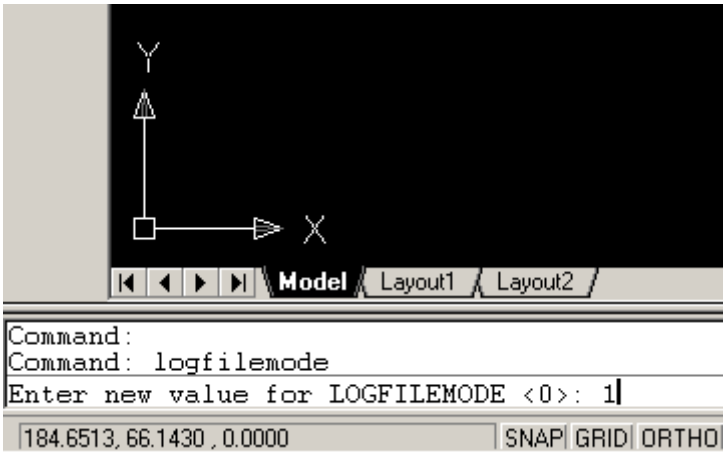
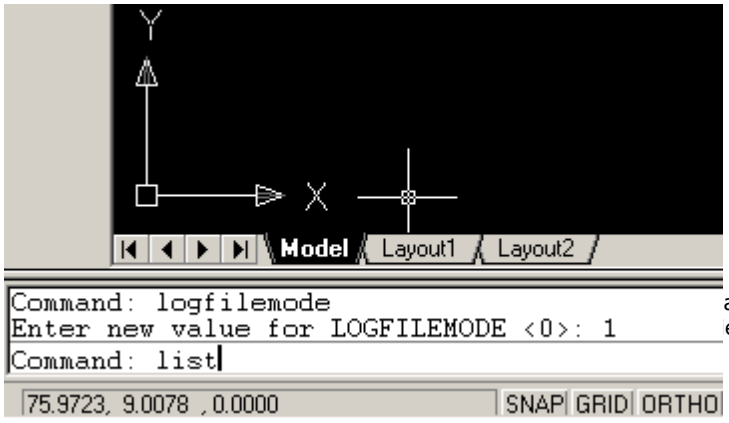
Important:

a) *AutoCad* drawing must contains only **lines** (not polylines, nor arcs, circles, etc.). Obviously, every shape that comes in the original drawing, can be approximated with lines. It is recommended to draw zones in a new layer (e.g., we will call it MOYSINIE) over the original drawing, using only lines. At the same time, we can exclude geometry details from the original drawing, which are not important, such as small holes in the structure. When we finish a drawing, we turn off all layers, except the one called MOYSINIE. Now we have a drawing prepared for the application.
b) Co-ordinates should have **positive** values, and **less then 1000**(m).
c) Make sure that the zone(s) (and all holes if there are any) is/are **closed** (every line is connected at both ends with the another line).
d) Check if lines that are very close to vertical or horizontal (90º and 270º, or 0º and 180º) are really vertical or horizontal; to be precise, assure that co-ordinates of both line points (X, or Y respectively), are **equal**. The easiest way is to draw these lines using the *AutoCad* function key **F8**.

Zones that have been drawn should be written in the "log" file generated by *AutoCAD*. Hereafter, this file will be called *FichLog*. All commands that follow will be executed in *AutoCAD*.
Open *FichLog* for data entry. Type "LOGFILEMODE", and introduce a value "1" (if it is "0", *FichLog* is closed, if it is "1", *FichLog* is opened for the data entry):



Type a command "LIST":



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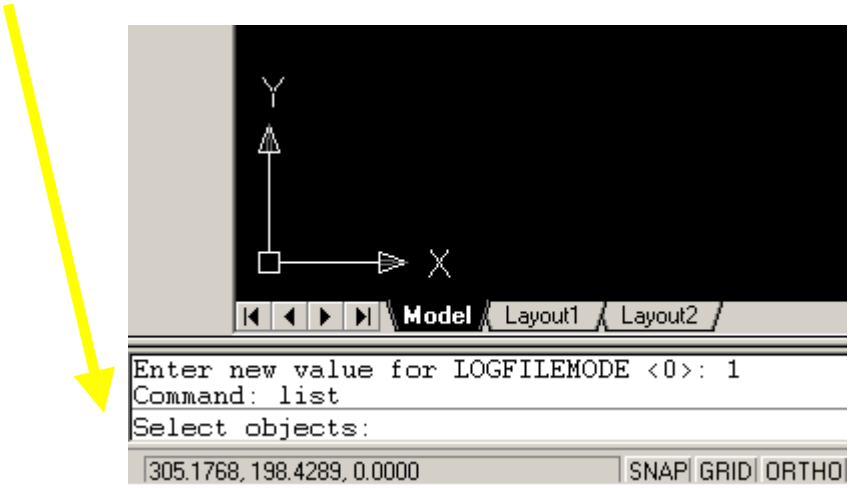
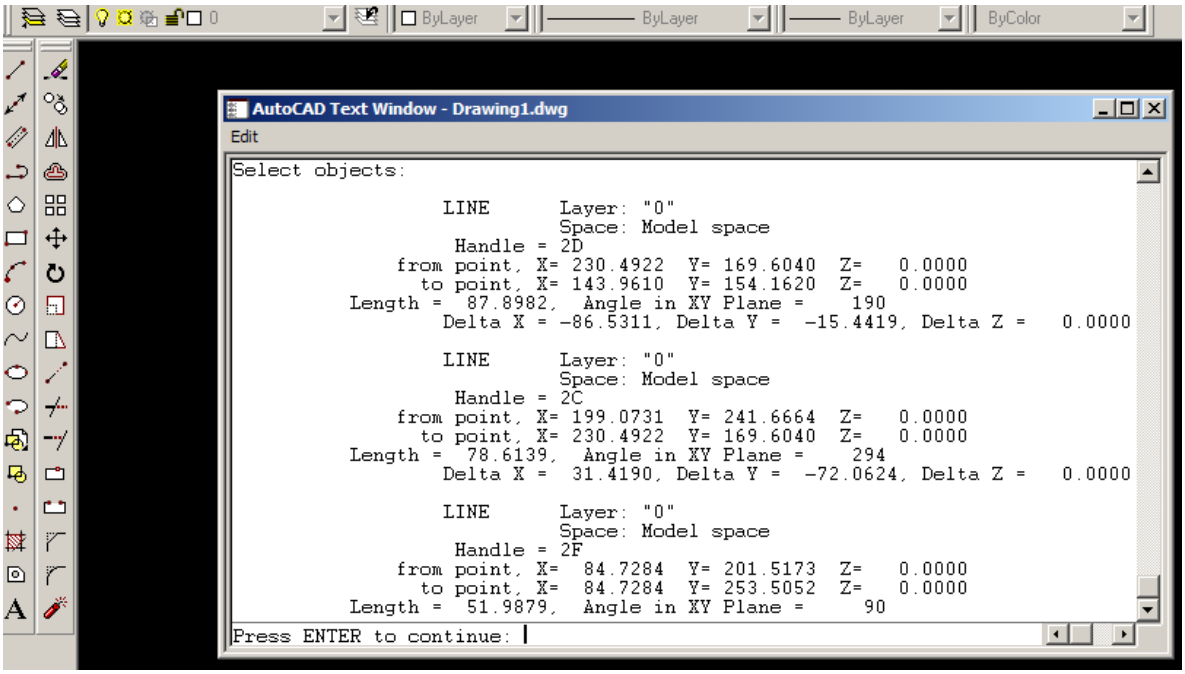
Now, *AutoCAD* will ask to select the zone – the message "Select objects:" will appear:



Important: the command "LIST" must be entered before the selection of every zone. To be precise, **only one and entire** zone is selected after the message "Select objects:". When all the lines of one zone are selected, press ENTER, and a window with the zone's co-ordinates will appear:


AutoCAD Text Window - Drawing1.dwg
Edit
Select objects:
LINE Layer: "0"
Space: Model space
Handle = 2D
from point, X= 230.4922 Y= 169.6040 Z= 0.0000
to point, X= 143.9610 Y= 154.1620 Z= 0.0000
Length = 87.8982, Angle in XY Plane = 190
Delta X = -86.5311, Delta Y = -15.4419, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 2C
from point, X= 199.0731 Y= 241.6664 Z= 0.0000
to point, X= 230.4922 Y= 169.6040 Z= 0.0000
Length = 78.6139, Angle in XY Plane = 294
Delta X = 31.4190, Delta Y = -72.0624, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 2F
from point, X= 84.7284 Y= 201.5173 Z= 0.0000
to point, X= 84.7284 Y= 253.5052 Z= 0.0000
Length = 51.9879, Angle in XY Plane = 90
Press ENTER to continue:

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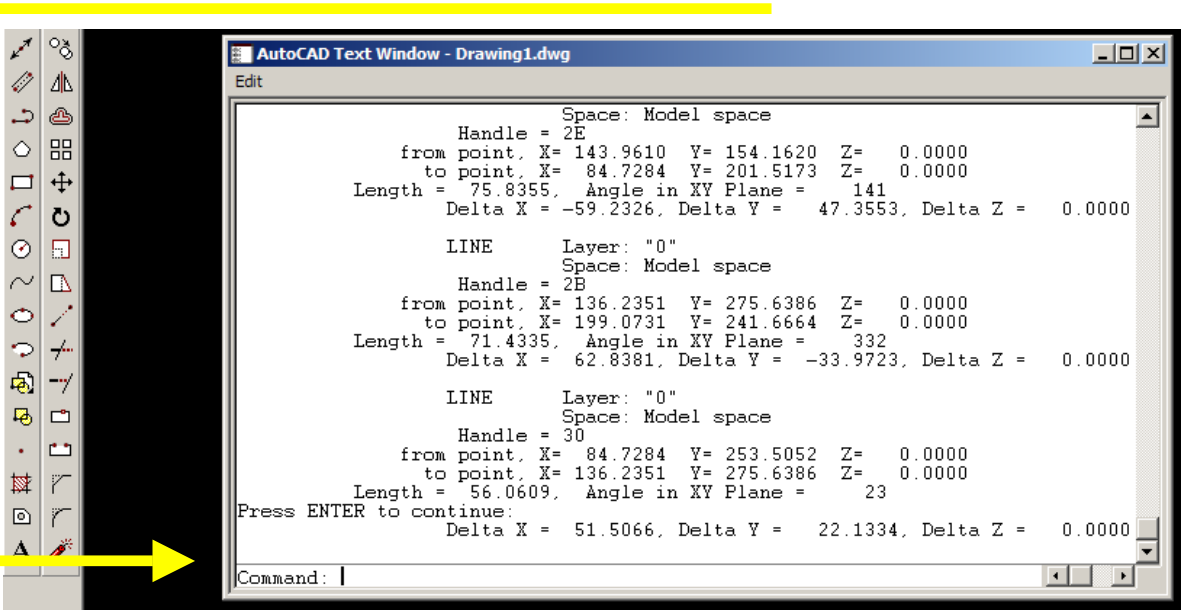
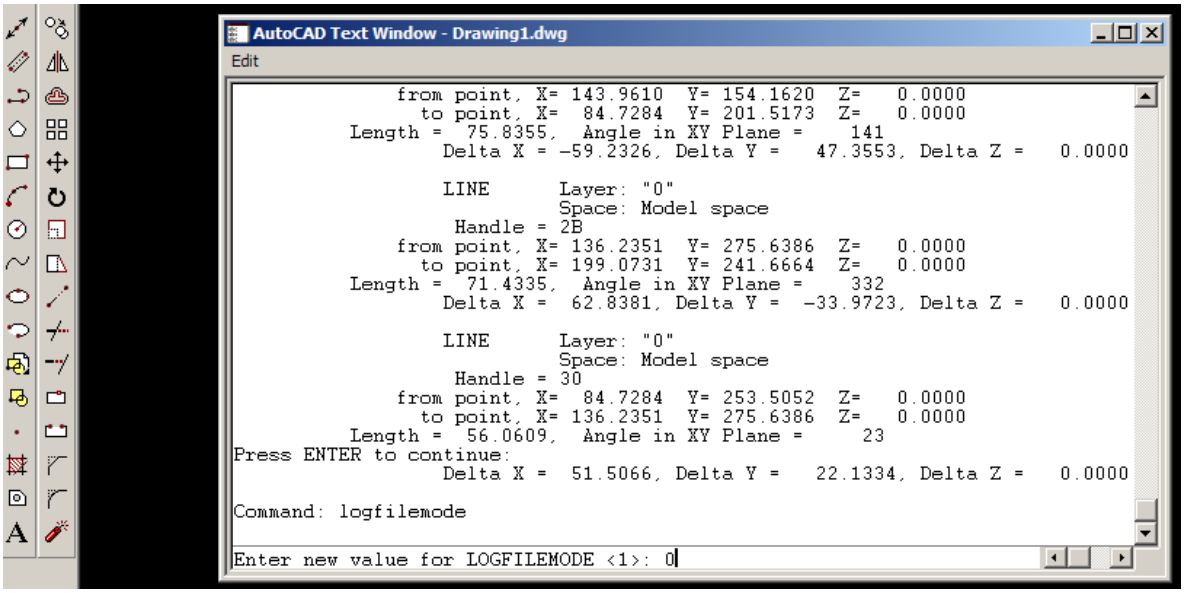
In the last text line the message "Press ENTER to continue" will appear, so continue pressing ENTER until the word "Command:" appears:


AutoCAD Text Window - Drawing1.dwg
Edit
Space: Model space
Handle = 2E
from point, X= 143.9610 Y= 154.1620 Z= 0.0000
to point, X= 84.7284 Y= 201.5173 Z= 0.0000
Length = 75.8355, Angle in XY Plane = 141
Delta X = -59.2326, Delta Y = 47.3553, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 2B
from point, X= 136.2351 Y= 275.6386 Z= 0.0000
to point, X= 199.0731 Y= 241.6664 Z= 0.0000
Length = 71.4335, Angle in XY Plane = 332
Delta X = 62.8381, Delta Y = -33.9723, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 30
from point, X= 84.7284 Y= 253.5052 Z= 0.0000
to point, X= 136.2351 Y= 275.6386 Z= 0.0000
Length = 56.0609, Angle in XY Plane = 23
Press ENTER to continue:
Delta X = 51.5066, Delta Y = 22.1334, Delta Z = 0.0000
Command:

Now, if there are more zones to be introduced, type "LIST" again, and follow the same procedure.

When all zones are entered, close the *FichLog* by typing the command "LOGFILEMODE" and entering the value "0":


AutoCAD Text Window - Drawing1.dwg
Edit
from point, X= 143.9610 Y= 154.1620 Z= 0.0000
to point, X= 84.7284 Y= 201.5173 Z= 0.0000
Length = 75.8355, Angle in XY Plane = 141
Delta X = -59.2326, Delta Y = 47.3553, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 2B
from point, X= 136.2351 Y= 275.6386 Z= 0.0000
to point, X= 199.0731 Y= 241.6664 Z= 0.0000
Length = 71.4335, Angle in XY Plane = 332
Delta X = 62.8381, Delta Y = -33.9723, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 30
from point, X= 84.7284 Y= 253.5052 Z= 0.0000
to point, X= 136.2351 Y= 275.6386 Z= 0.0000
Length = 56.0609, Angle in XY Plane = 23
Press ENTER to continue:
Delta X = 51.5066, Delta Y = 22.1334, Delta Z = 0.0000
Command: logfilemode
Enter new value for LOGFILEMODE <1>: 0

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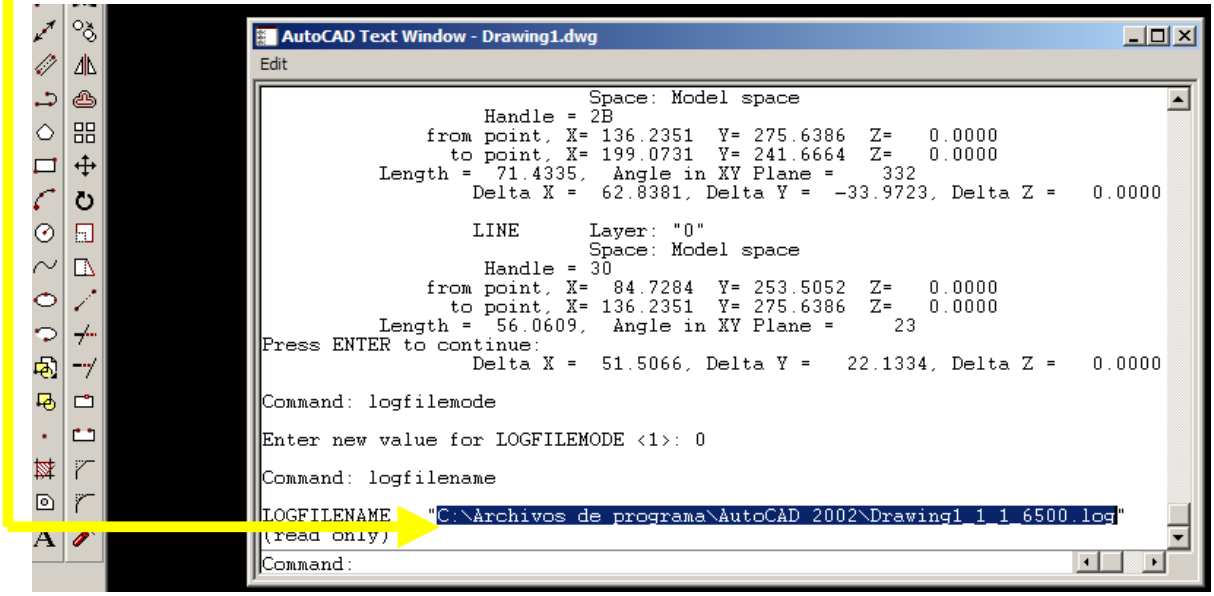
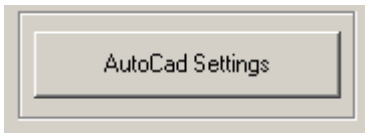
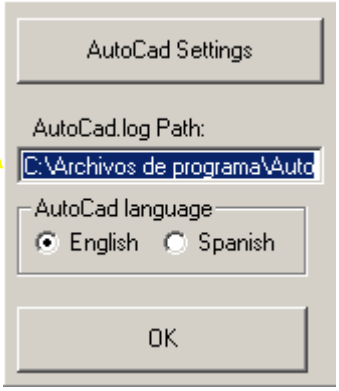
Finally, type the command "LOGFILENAME" and save (copy) the answer:

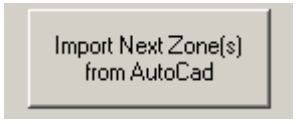

AutoCAD Text Window - Drawing1.dwg
Edit
Space: Model space
Handle = 2B
from point, X= 136.2351 Y= 275.6386 Z= 0.0000
to point, X= 199.0731 Y= 241.6664 Z= 0.0000
Length = 71.4335, Angle in XY Plane = 332
Delta X = 62.8381, Delta Y = -33.9723, Delta Z = 0.0000
LINE Layer: "0"
Space: Model space
Handle = 30
from point, X= 84.7284 Y= 253.5052 Z= 0.0000
to point, X= 136.2351 Y= 275.6386 Z= 0.0000
Length = 56.0609, Angle in XY Plane = 23
Press ENTER to continue:
Delta X = 51.5066, Delta Y = 22.1334, Delta Z = 0.0000
Command: logfilemode
Enter new value for LOGFILEMODE <1>: 0
Command: logfilename
LOGFILENAME "C:\Archivos de programa\AutoCAD 2002\Drawing1_1_1_6500.log"
(read only)
Command:

From here on, all the screens are from the program *Moysinie*.



Returning to the program ***Moysinie***, to configure the connection with *AutoCAD*, press the button **AutoCAD Settings**. The text box will appear to introduce the name (and the path) of the *AutoCAD* "log" file of the zone(s) drawing. Paste the copied name in the box and press OK:





After *AutoCAD* setting, press the button **Import Next Zone(s) from AutoCAD**. The new window will appear to introduce the number of new zones to be imported from *AutoCAD*, and afterwards, each zone will be shown. The number of the same zones ("1" by default) and the zone name ("Zone i" by default) must be confirmed, or introduced.

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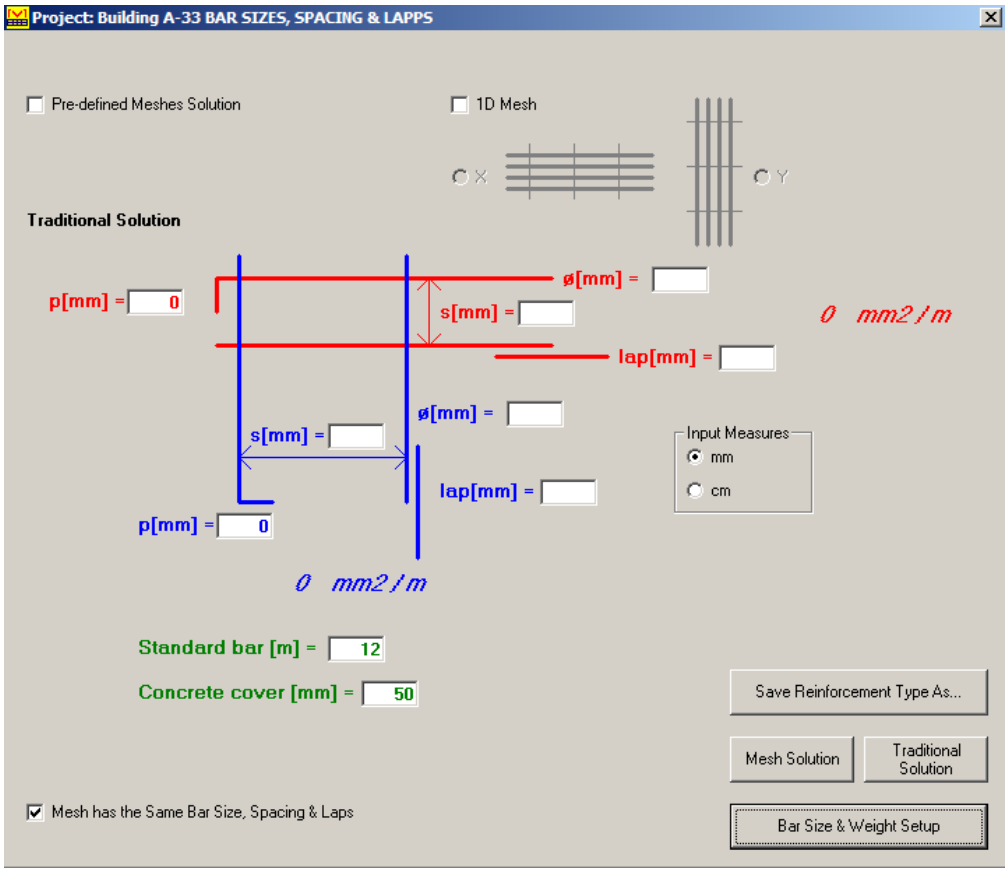
5. Reinforcement Introduction

Pressing the **Mesh & Traditional Solution** button in the Project Edit window, the window of the reinforcement characteristics appears:



As the program calculates both mesh and traditional solutions, it is possible to have two different types of reinforcements. This can be interesting in case we want to substitute the traditional by a double mesh reinforcement, or if the traditional and mesh reinforcement have different overlaps. In the example, however, both traditional and mesh reinforcements are the same.
Moreover, it is possible to set up the standard bar length and the concrete cover. By pressing the button **Bar Size & Weight Setup**, the bar diameters, weights and bending diameters can be defined.

Different Reinforcements Types
After the bar sizes, spacing and overlapping of both directions are defined, pressing the **Save Reinforcement Type As...** button, the reinforcement type name should be introduced (e.g. *Sup*, *Inf*, ...). This is repeated as many times as

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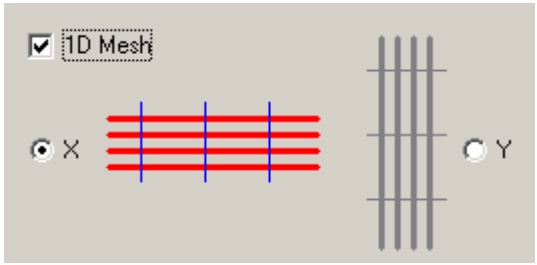
it is the number of different reinforcement types. The outputs are being stored in the files named by the zone and reinforcement type (e.g. *Zone 1-**Sup***, *Zone 1-**Inf***, *Zone 2-**Sup***, ...).
To proceed to the optimization with the next reinforcement type (e.g. *Inf*), the process of the current reinforcement type (*Sup*), should be terminated. This means that the window with the mesh of the current optimization should be opened (see *9. Mesh Edit*). Pressing the **Next Reinforc. Type** button, starts the optimization of the next reinforcement type (*Inf*).

One-Directional Mesh
If the reinforcement type corresponds with the 1D mesh of the direction "X", mark the corresponded boxes.



In such case, the overlapping in the direction "Y" disappears. The reinforcement type should be saved as it was explained previously.

The number of different reinforcement types practically is not limited, so if it is the case, the types of 1D and 2D meshes can be saved together.

6. Traditional Solution

Pressing the **Traditional Solution** button, the new window with the traditional solution's details will appear. The bending schedules can be checked and printed out.

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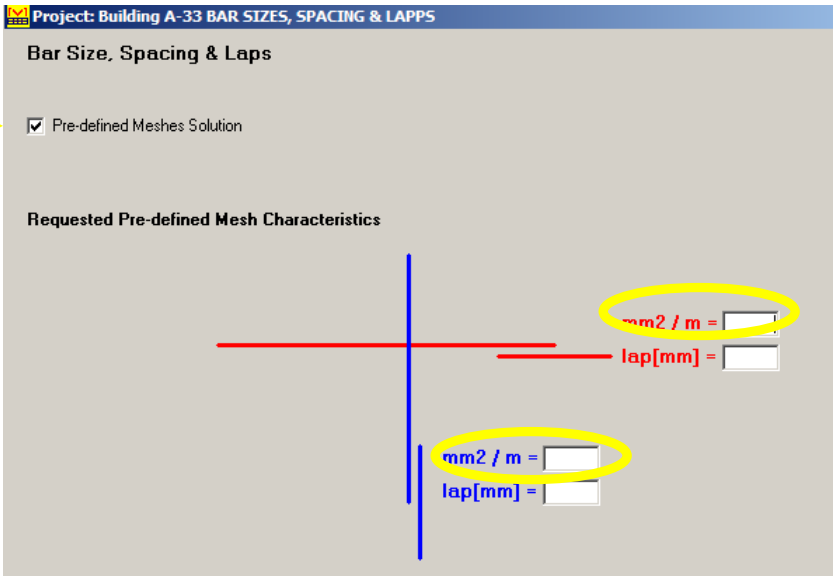
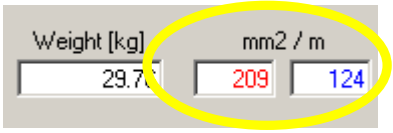
7. Reinforcement area [mm2/m]

When the optimization with pre-defined meshes is to be done, the zones reinforcement area (ZRA) should be introduced in both directions (if omitted, will be considered as 0, i.e. any mesh type will accomplish the target). In the optimization process, the ZRA will be compared with the pre-defined meshes' reinforcement areas (MRA), and only if the MRA ≥ ZRA (for each direction), the mesh could be considered as a possible solution.


Project: Building A-33 BAR SIZES, SPACING & LAPPS
Bar Size, Spacing & Laps
Pre-defined Meshes Solution
Requested Pre-defined Mesh Characteristics
mm2 / m =
lap[mm] =
mm2 / m =
lap[mm] =

The MRA (for each direction) appear in the Mesh Properties window (see *9. Mesh Edit*):



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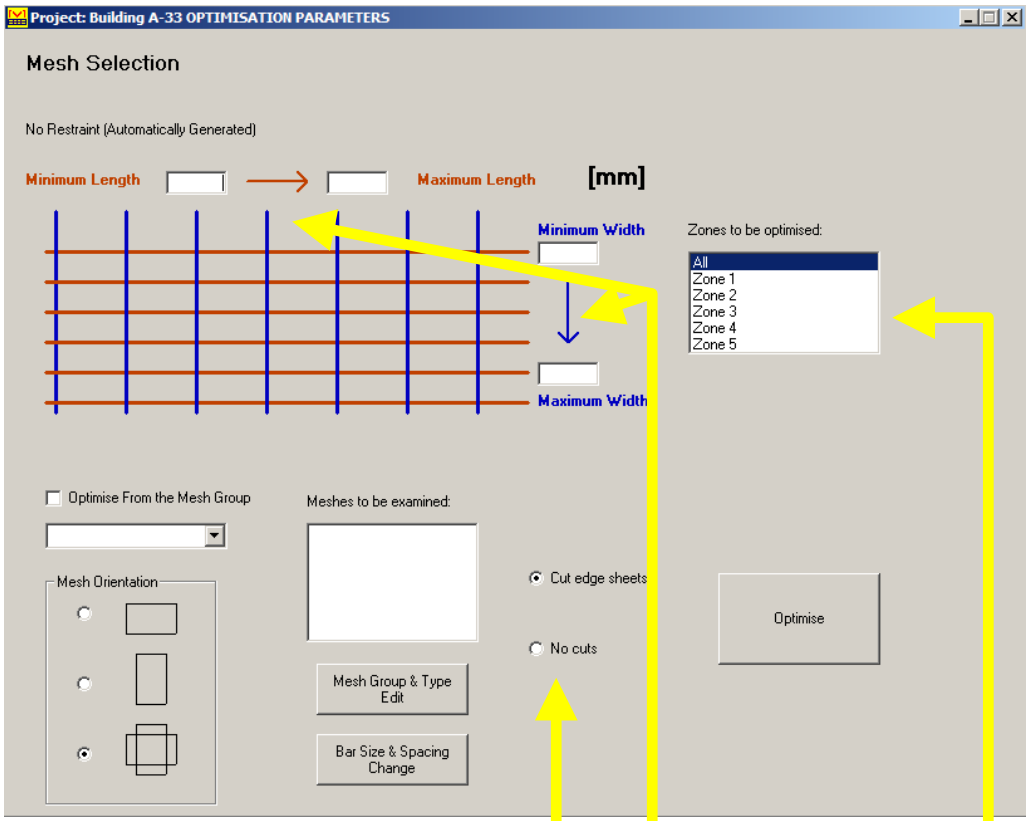
8. Mesh Optimisation Parameters

When the **Mesh Solution** button is pressed, the following window appears:

If the bar sizes and distances are previously introduced (see *5. Reinforcement Introduction*), both Pre-defined and Non-Pre-defined (No Restraint) mesh optimisation process can be executed, and if the reinforcement areas have been introduced (see *7. Reinforcement area [mm²/m]*), only Pre-defined mesh optimisation can be done.



If the No Restraint mesh is opted, the mesh length and width limits should be entered. If not all zones are to be optimised (with the same mesh), select which one are to be optimised together.
The last (edge) sheets could be cut to fit the zone edge, or "pushed" inside the zone, and in that case no sheet cuts will be performed.

The **Mesh Orientation** in the selected zones layouts can be forced to the horizontal or vertical direction. If the orientation is not forced (the 3rd option on the screen), the program calculates the best mesh orientation for each zone.

If the Pre-defined mesh optimisation is opted, choose the **Mesh Group** from which the meshes are to be chosen. If not all, choose **Meshes to be examined**.

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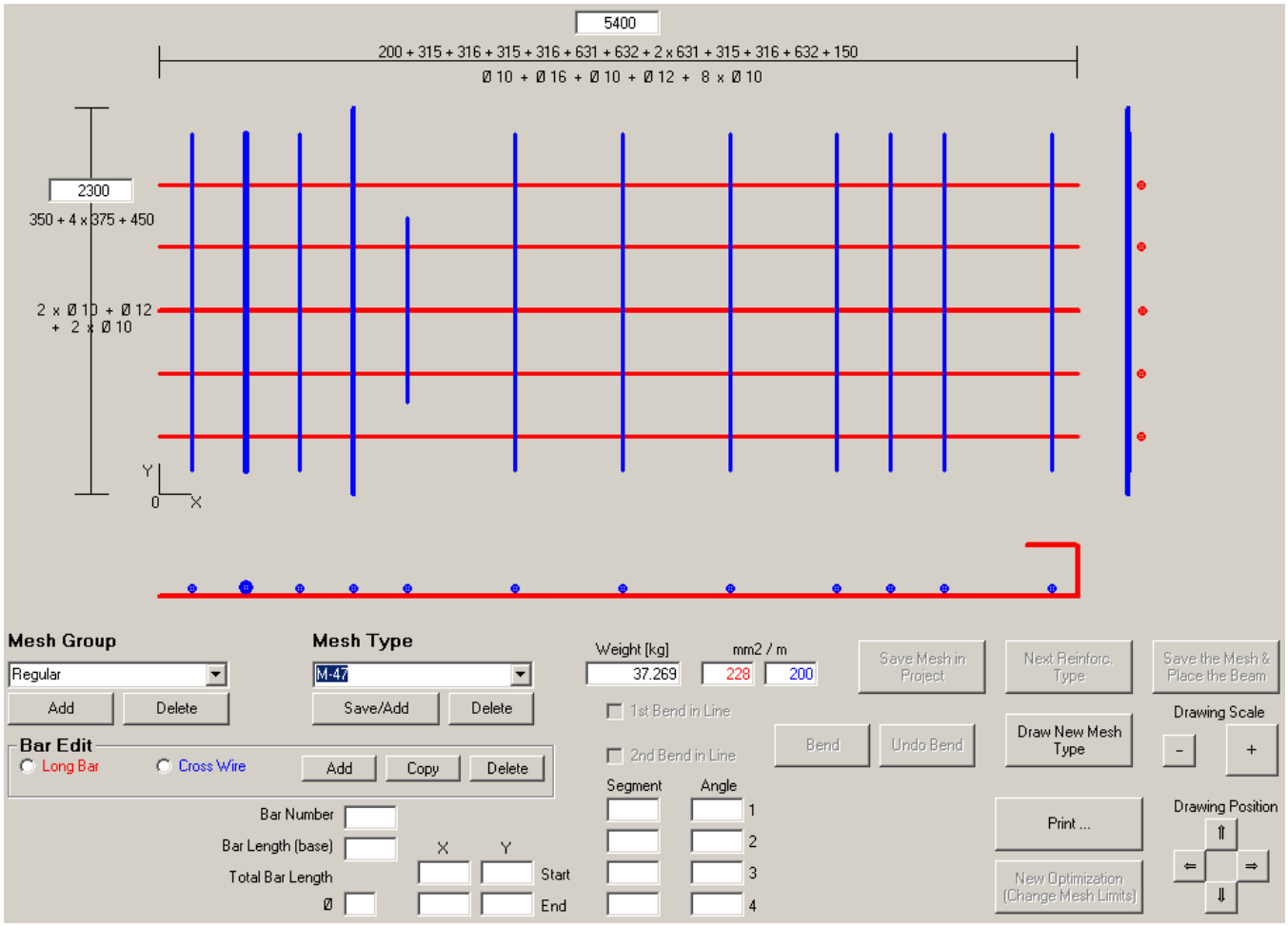
9. Mesh edit

Pressing the **Pre-defined Mesh Edit** button,

the mesh edit window will be opened.

Selecting the Mesh Group and Mesh Type (previously defined), the mesh drawing appears:



Each bar can be modified separately (different diameter, length, position, bending). It is necessary to mark the bar direction (Long Bar or Cross Bar), type the Bar Number, and its properties will be shown, ready to be modified.
To create the Mesh Group, type the mesh group name, and press the button **Add** below. Pressing the button **Save/Add** below the Mesh Type name, the displayed mesh will be saved into the current Mesh Group.

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a) Mesh Groups/Types storage

Every project has its own mesh groups and types. If it is necessary, by coping all the files from the directory *...\Moysinie\Projects\Project **XY**\Mesh Type* to the directory *...\Moysinie\Projects\Project **PQ**\Mesh Type* the new project PQ will have the same mesh groups and types as the old project XY.

b) Bar Edit

When the bar is selected, all three projections are shown painted in green.

c) New Mesh Type Creation

It is possible to enter a new mesh type, by pressing the button **Draw New Mesh Type**.

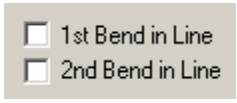
One bar in each direction will be displayed. By coping and modifying them, the new mesh can be created.

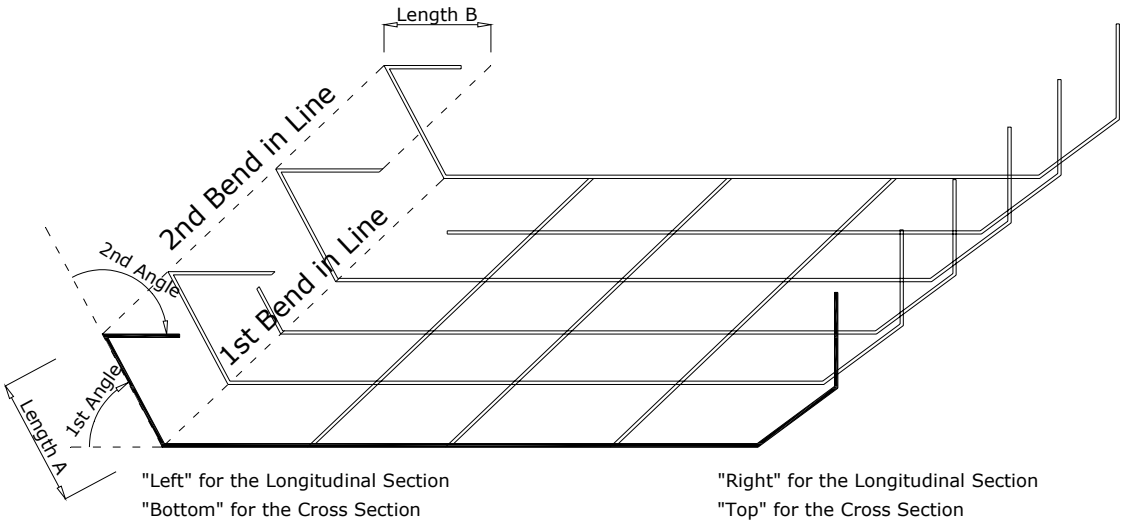
d) Mesh Bending

The mesh can be bent in all four extremes, two times each one. The bending can be realized in two ways:

d.1.) "Bar-by-Bar Bending". In the Bar Edition process where one by bar is being selected, the values of the bar segment (length) to be bent and the bending angle can be introduced/modified.

d.2.) "All-Bars-in-Line Bending". Choosing the direction (Long Bar or Cross Wire) and the option **1st Bend in Line**, or **2nd Bend in Line**, the corresponding text boxes are opened to introduce the Length to Bend and the Bending Angle. The illustration of the Bend in Line is shown below:





"Left" for the Longitudinal Section
"Bottom" for the Cross Section

"Right" for the Longitudinal Section
"Top" for the Cross Section

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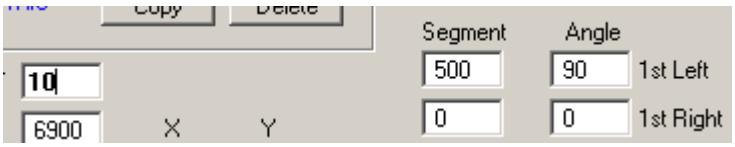
It is obvious that it is necessary to do the **1st Bend in Line** before the **2nd Bend in Line**. Moreover, if at least one bar is already bent once or twice on the same side, the **1st Bend in Line** on that side cannot be performed. Equally, if at least one bar is already bent twice on the same side, the **2nd Bend in Line** on that side cannot be performed.
So, the easiest way to bend the mesh is to start with the plane mesh, bend it using **1st Bend in Line**, where (see the previous illustration),

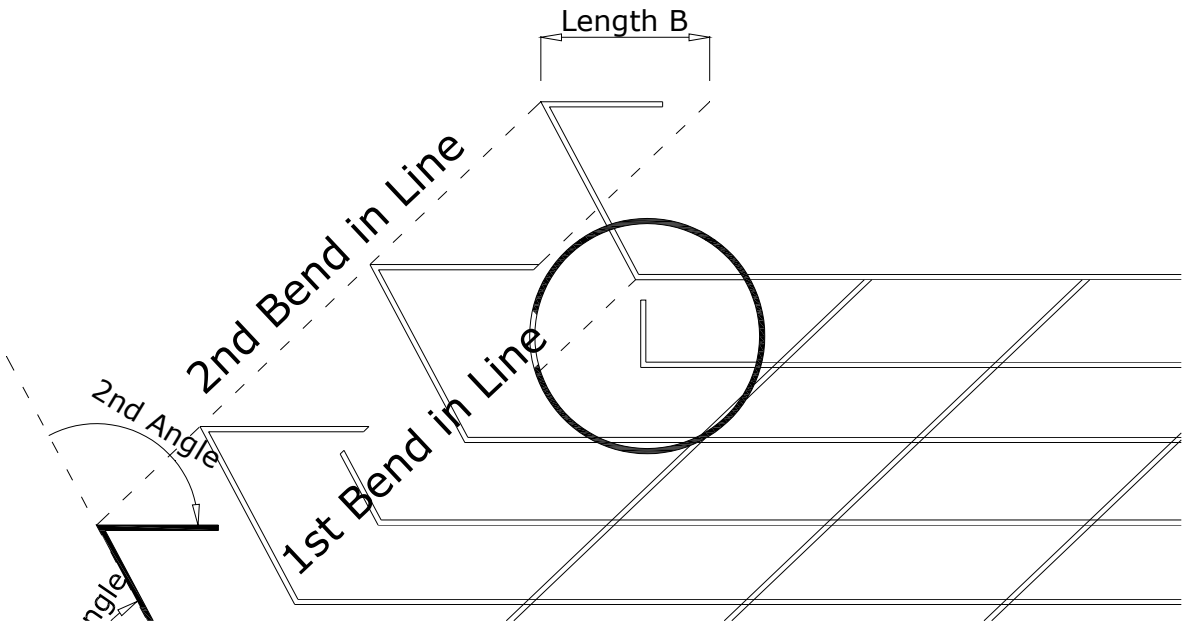
Length to Bend = Length A + Length B.

Then, using **2nd Bend in Line** bend it again, where

Length to Bend = Length B.

Afterwards, if it is necessary, bend some bars separately, using "Bar-by-Bar Bending" as it is shown below:





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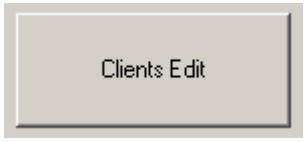
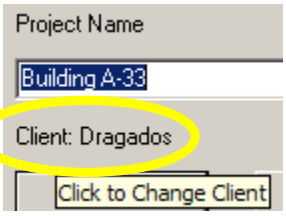
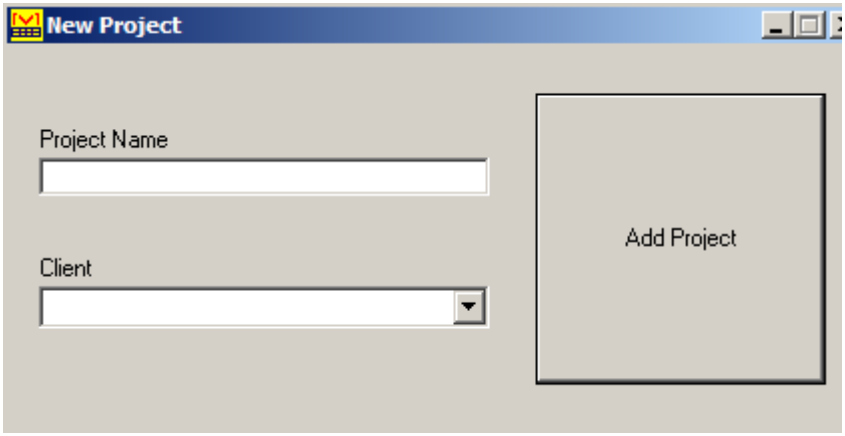
10. Clients Edit



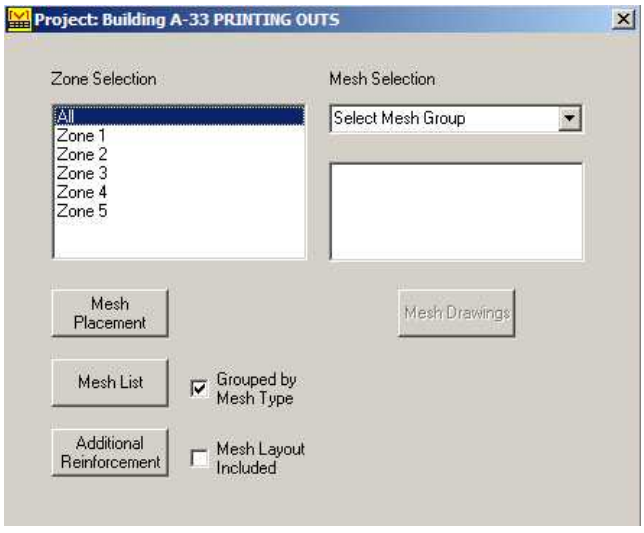
Pressing the button **Clients Edit** the new window is opened, and it is possible to add/remove/edit a client. In any stage, when the Project is opened, clicking over the Client's name is possible to change or modify it. When the New Project is being introducing, the Client's name can be searched, or introduced new one (and later on modified), or omitted (and later on introduced).





11. Printing Features

Program generate the *Microsoft Excel* sheet and print it out on any installed printer. The printing can be done within any window (Mesh Placement, Mesh Properties, Bending Schedule). However, if it is necessary to print more (or all) project zones, and/or more or all mesh types, clicking the **Print Project** button on the initial window, the Printing Out window will be opened:



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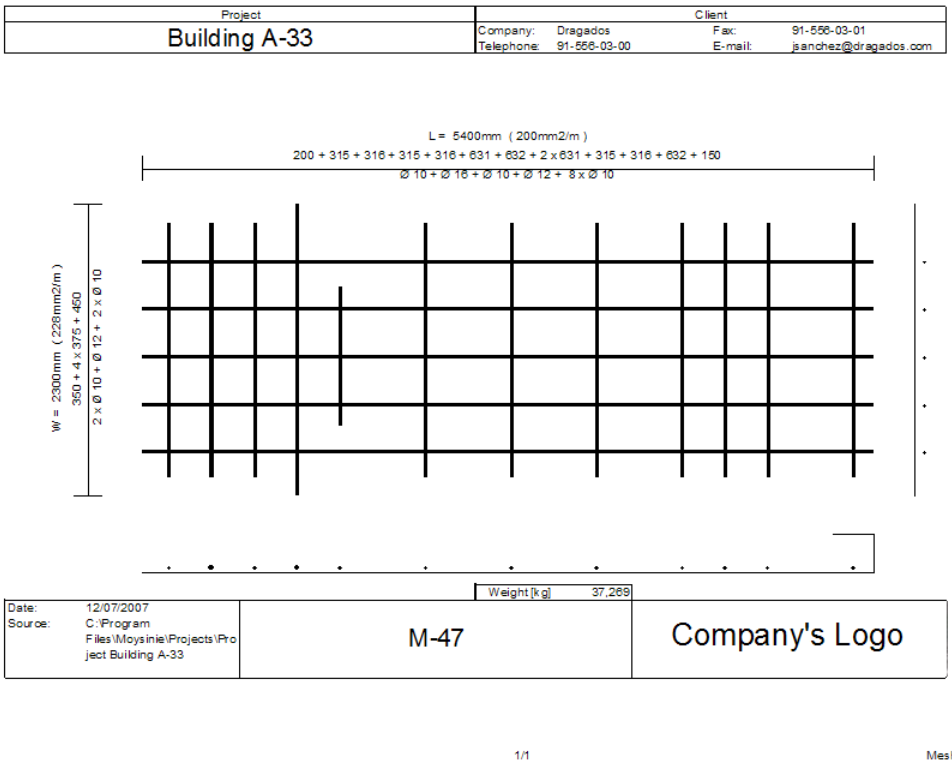
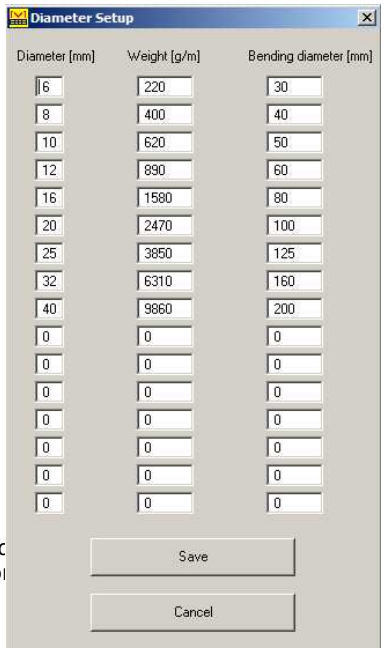
The header of a print out shows the Project and the Client's information, and the footer, the drawing and the Company's details. The Company details, as a logo image, named *Logo.jpg* should be placed in the directory *…\Moysinie\Misc*, where from the program will call it.


Project
Building A-33
Client
Company: Dragados
Telephone: 91-556-03-00
Fax: 91-556-03-01
E-mail: jsanchez@dragados.com
L = 5400mm (200mm2/m)
200 + 315 + 316 + 315 + 316 + 631 + 632 + 2 x 631 + 315 + 316 + 632 + 150
Ø 10 + Ø 16 + Ø 10 + Ø 12 + 8 x Ø 10
W = 2300mm (228mm2/m)
350 + 4 x 375 + 450
2 x Ø 10 + Ø 12 + 2 x Ø 10
Weight [kg] 37,269
Date: 12/07/2007
Source: C:\Program Files\Moysinie\Projects\Project Building A-33
M-47
Company's Logo
1/1
Mesh Drawing

12. Program Languages

It is possible to change the program language. To produce the change, after choosing the language, it is necessary to restart the program.

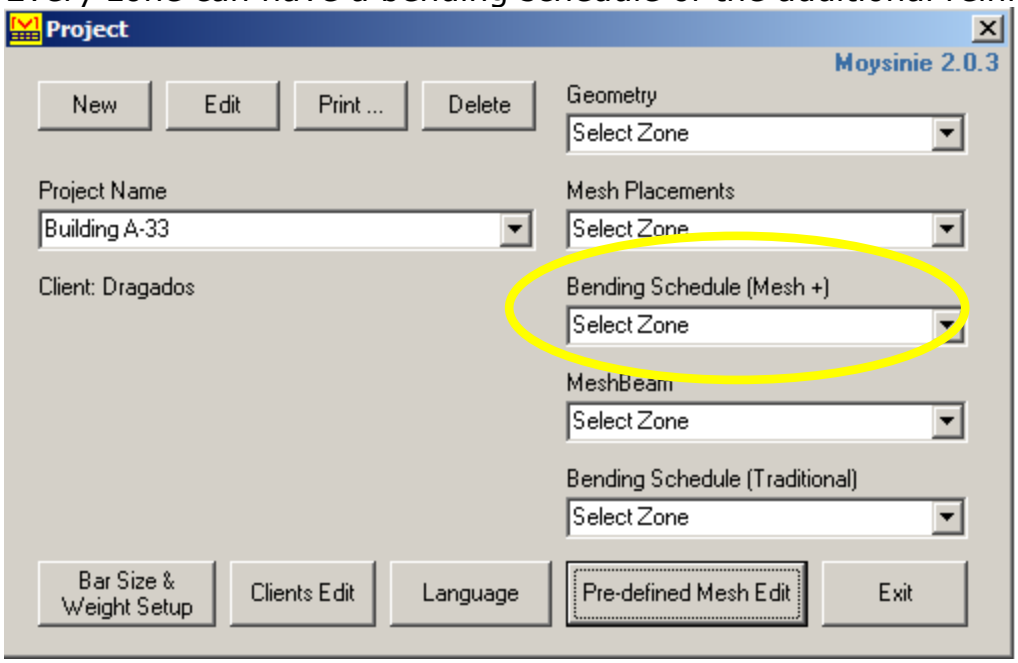
13. Diameter Setup



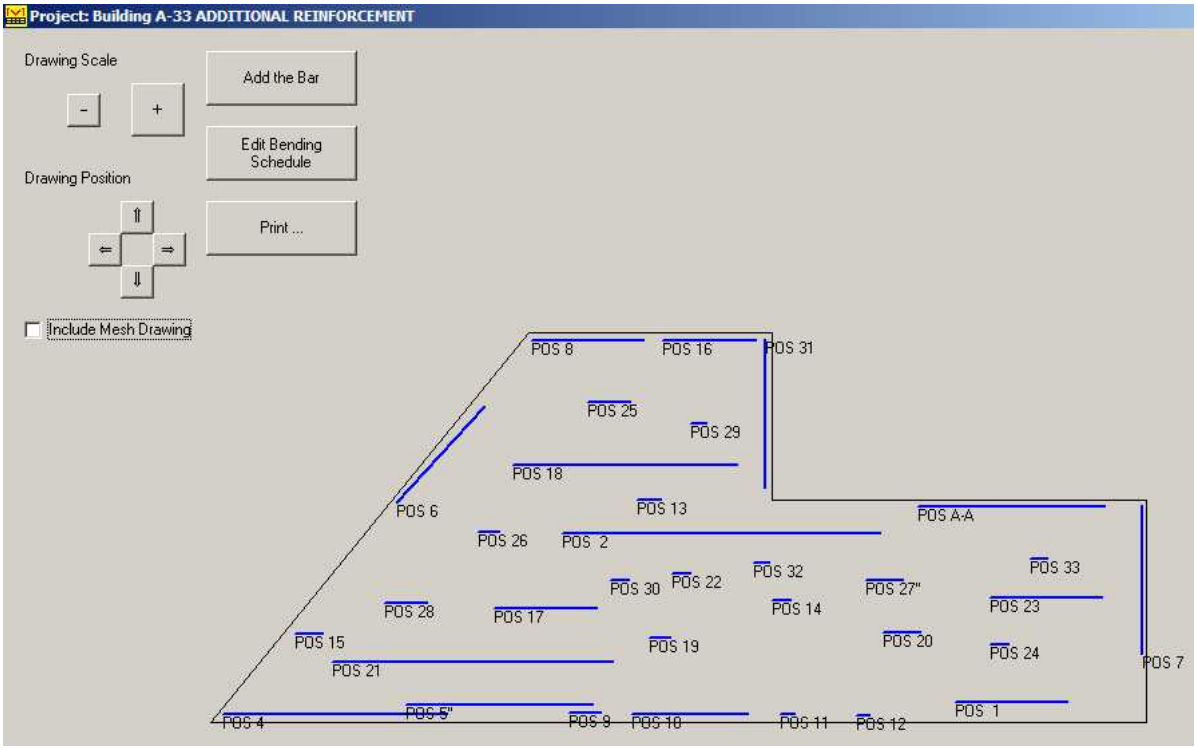
Pressing the **Bar Size & Weight Setup** button, the Diameter Setup window appears. Typing the bar diameter, the weight and the bending diameter are automatically calculated. However these values can be modified to any number.

14. Additional Reinforcement

Every zone can have a bending schedule of the additional reinforcement.



By choosing the zone to be edited, the zone drawing (with the additional reinforcement layout if there is any) appears:



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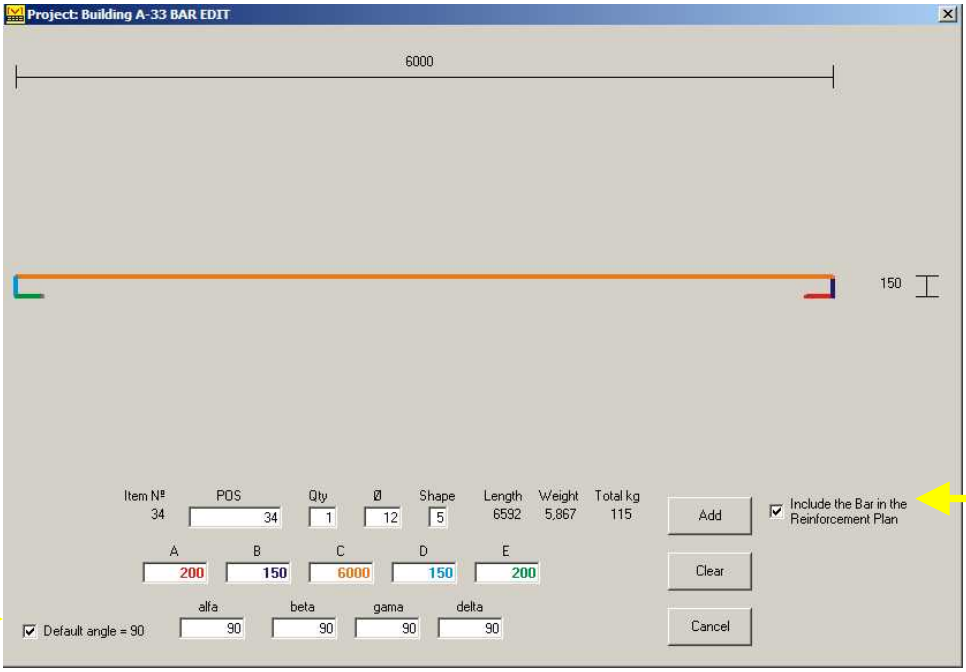
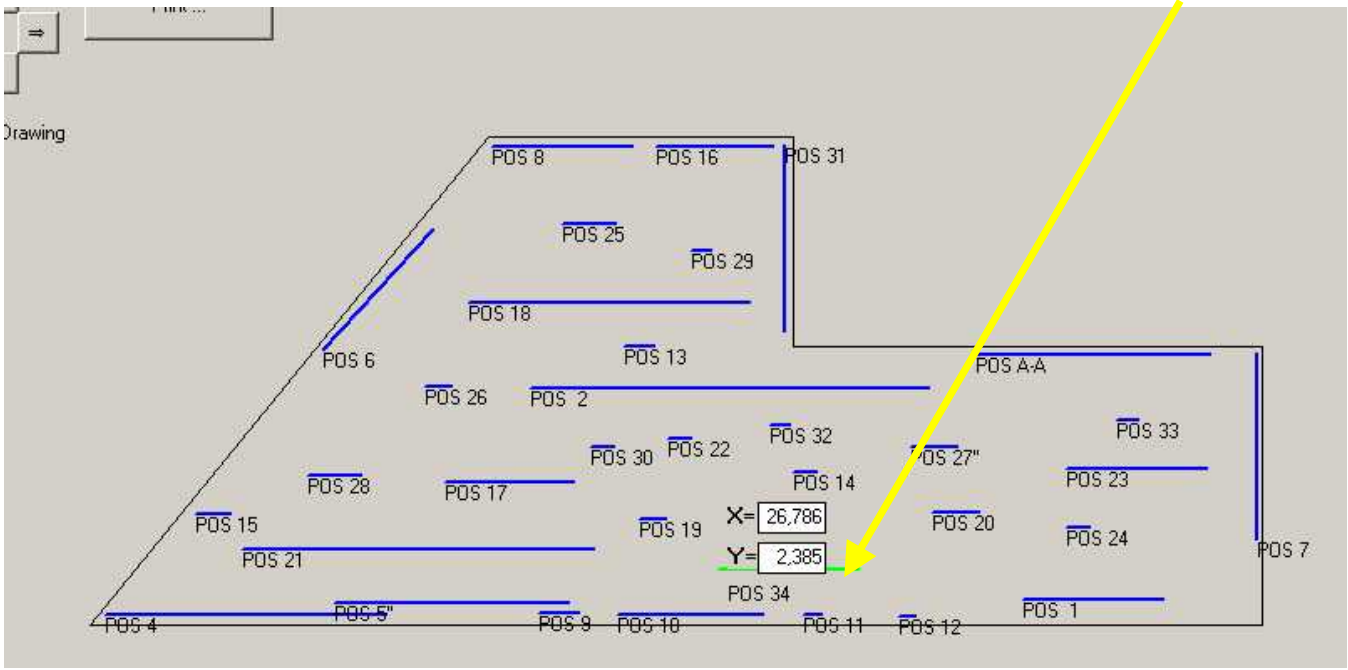
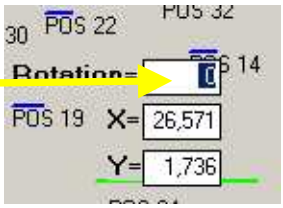
If a new bar is to be added, by clicking the button **Add the Bar**, the new window is opened. We introduce the bar parameters (POS, quantity, diameter, shape, segments and angles):



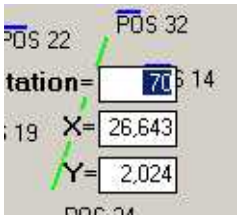
The *Shape* is a number of the bar segments (from 1 to 6). Segments are named A, B, C, … F. The angles between segments are α, β, γ, δ and ε. During the segments introduction, the bar drawing is being executing. Every segment has its own colour (both number and drawing). It is possible to have automatically all angles = 90º (as in the example). In any moment is possible to change any bar parameter. When the bar introduction is finished, if the box **Include the Bar in the Reinforcement Plan** is checked, the bar will be placed in the zone layout:

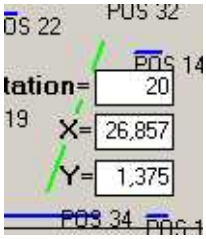


The new bar (POS 34) is green, and the co-ordinates X and Y are shown. If the bar has to be rotated, click the right mouse button, and the new box will appear:

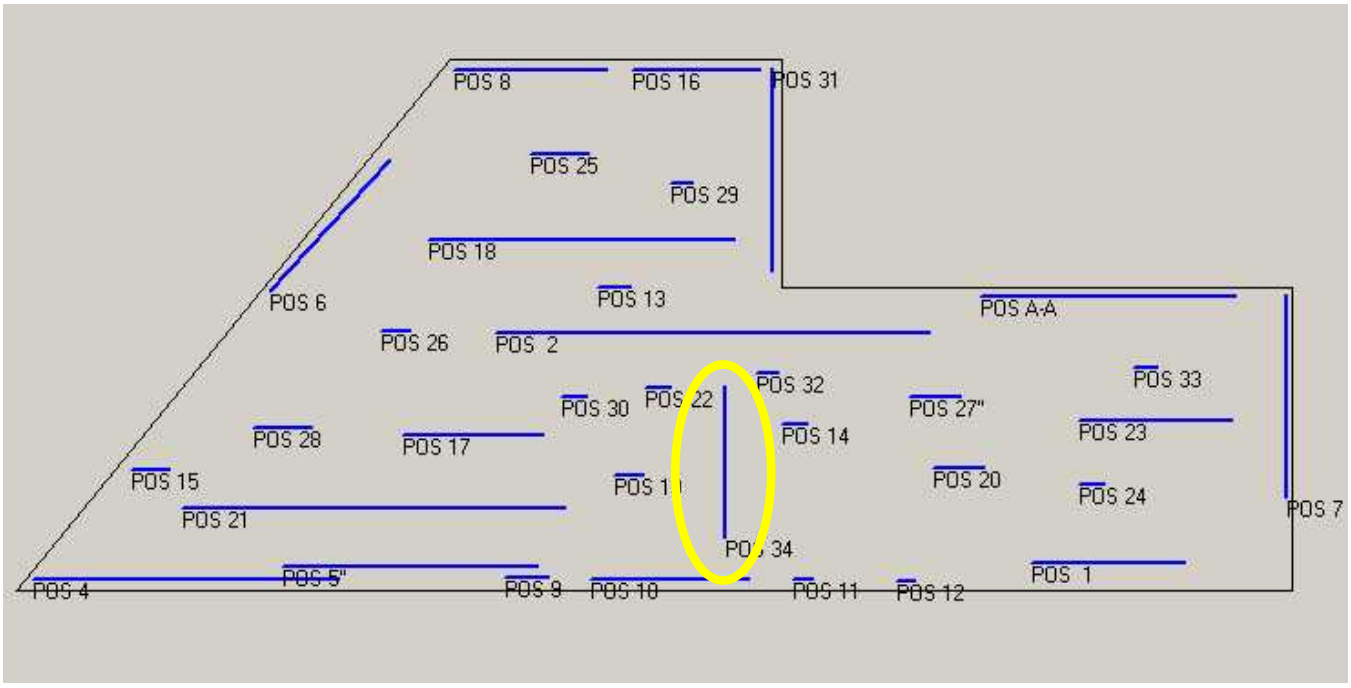


If type *70*, the bar will be rotated for 70 degrees. If the correct rotation was 90, by clicking the right mouse button again, the total angle will be shown (in this case *70*). Now, type *20* (to complete *90*).





When *X*, *Y* and angle are correct, click the left mouse button to accept the bar position:



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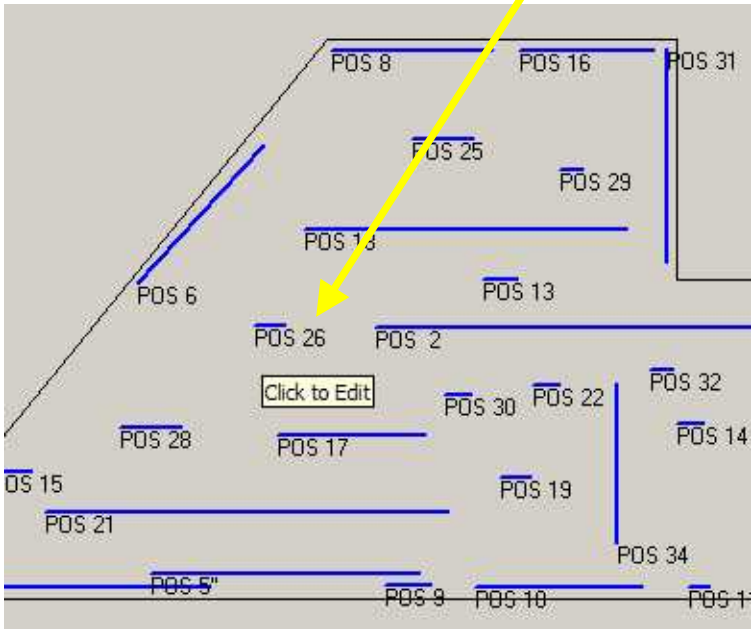
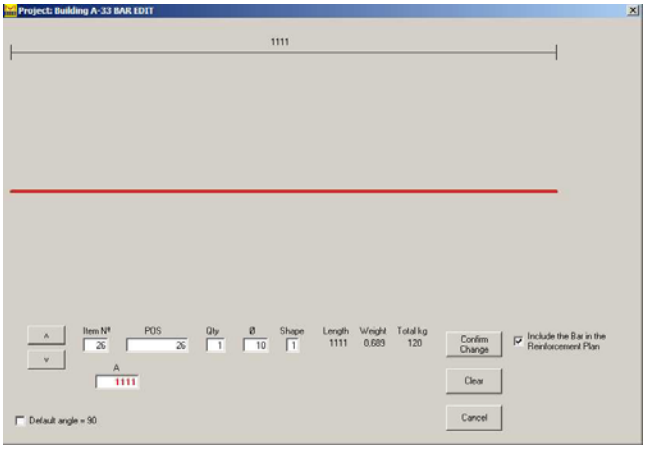
However, in any moment, bar characteristics and/or bar position can be modified. Just click over the bar POS (for example POS 26),



and the Bar Window will be opened:



After the bar correction, press the **Confirm Change** button. If the box **Include the Bar in the Reinforcement Plan** is unchecked, this position will not be drawn.

Then again, in any moment clicking the **Edit Bending Schedule** button (in ADDITIONAL REINFORCEMENT window), and checking the box **Include the Bar in the Reinforcement Plan** , it will be possible to place the bar into the zone drawing.

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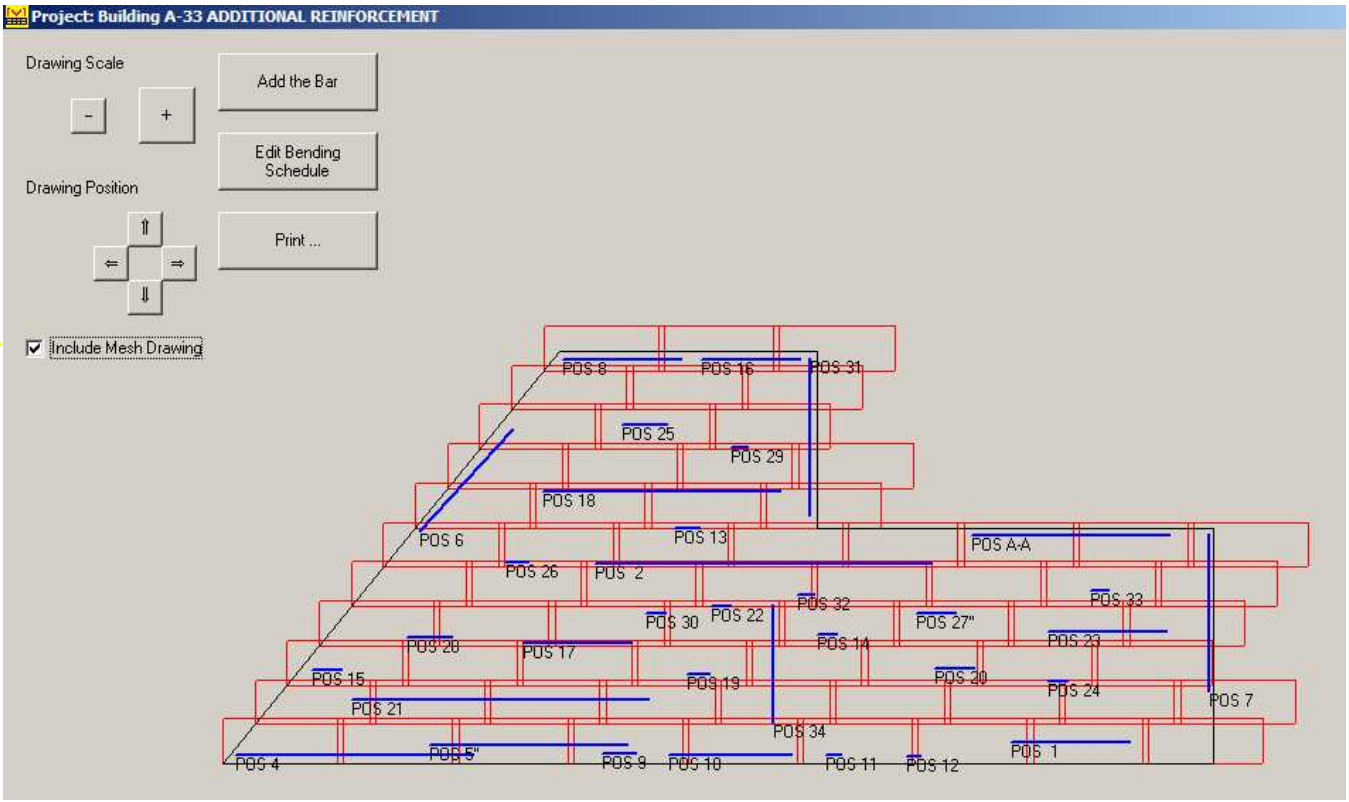
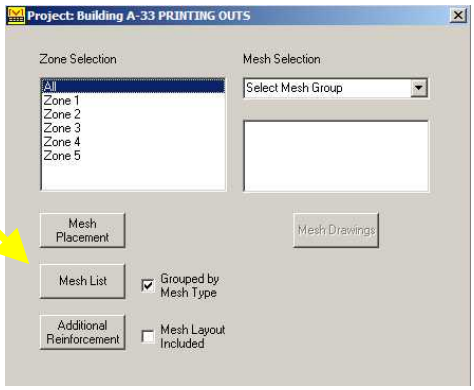
If the box **Include Mesh Drawing** is checked, the mesh placement will be shown:



15. Printing out Additional Reinforcement

The additional reinforcement (AR) list and drawing (with or without the Mesh layout included) can be printed.



The AR list includes the bar characteristics as well as its drawing:

Project: Building A-33		Zone 1										Client: Dragados					
POS	Shape	Qty	Ø	L [mm]	[kg]	A	α	B	β	C	γ	D	δ	E	ε	F
1		1	10	6362	3,940	200	90	6000	90	200						
2		1	10	17177	10,650	200	90	17000								
A-A		1	12	10000	8,900	10000										
4		1	10	14000	8,680	14000										

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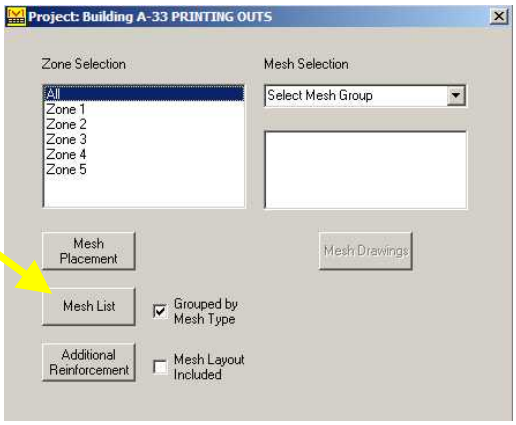
16. Printing Out Mesh List

The Project's mesh lists can be printed out, too. The list can be grouped by mesh type or not (zone by zone).



In any case, to print out the mesh list, it is necessary to generate (include) the mesh drawing into the zone.

In the MESH PROPERTIES window (after the optimization), it is necessary to click the **Save Mesh in Project** button (see *8. Mesh edit*):

The mesh list shows mesh characteristics:

Project		Zone 2 / Zone 3 / Zone 4 / Zone 5					Client	
Building A-33							Dragados	
POS	Qty	Length / Width	$N°_L$ / $N°_C$	$Ø_L$ / $Ø_C$	D_L / D_C	mm^2/m_L / mm^2/m_C	kg	Total
M-44	341	6000 / 2000	5 / 9	10 / 10	375 / 631	209 / 124	29,760	10.148
M-46	189	6000 / 2300	5 / 12	10 / 11	375 / 459	228 / 200	37,269	7.044
								17.192

$N°_L$ and $N°_C$ are the number of longitudinal and cross bars. $Ø_L$ and $Ø_C$ are diameters, D_L and D_C are distances and mm^2/m_L and mm^2/m_C are the reinforcement areas for respective direction.
In case when the diameters and distances are not equal, the average ones are calculated as per:

$$Ø = \sqrt{((\Sigma Ø_i^2)/n)}$$
$$D = (\Sigma D_i)/(n-1)$$

Where **n** is number of bars (of the respective direction).

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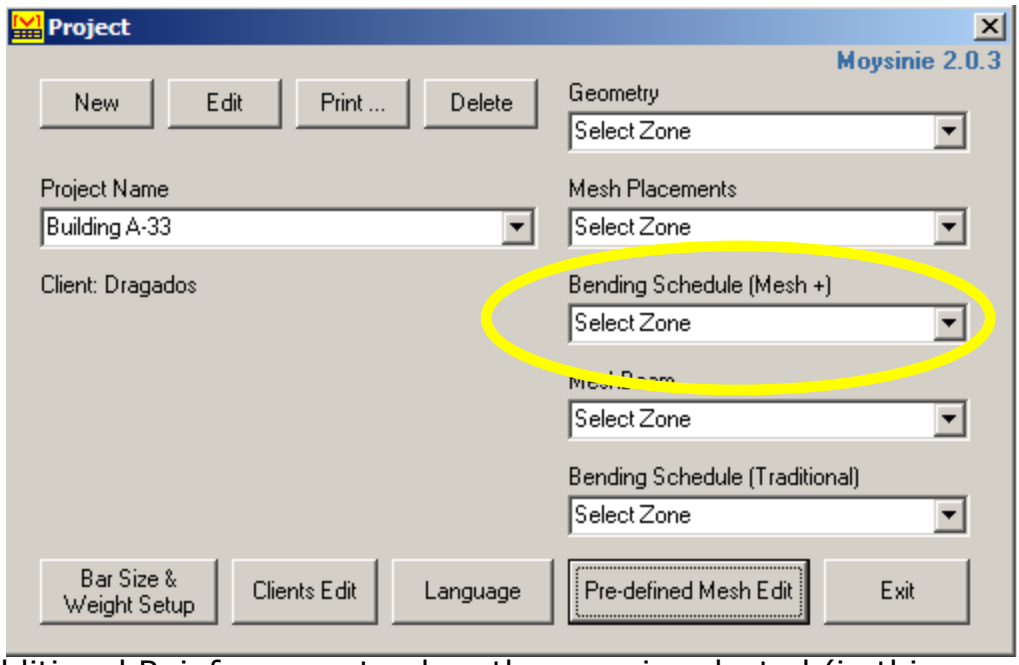
17. MeshBeam Module

This module is used when some elements, such as beams or columns, are to be produced as a result of a mesh bending.

Zone selection:



As in the Additional Reinforcement, when the zone is selected (in this case, Zone 1), its beams are shown (in this case, only one beam named *B-1*):

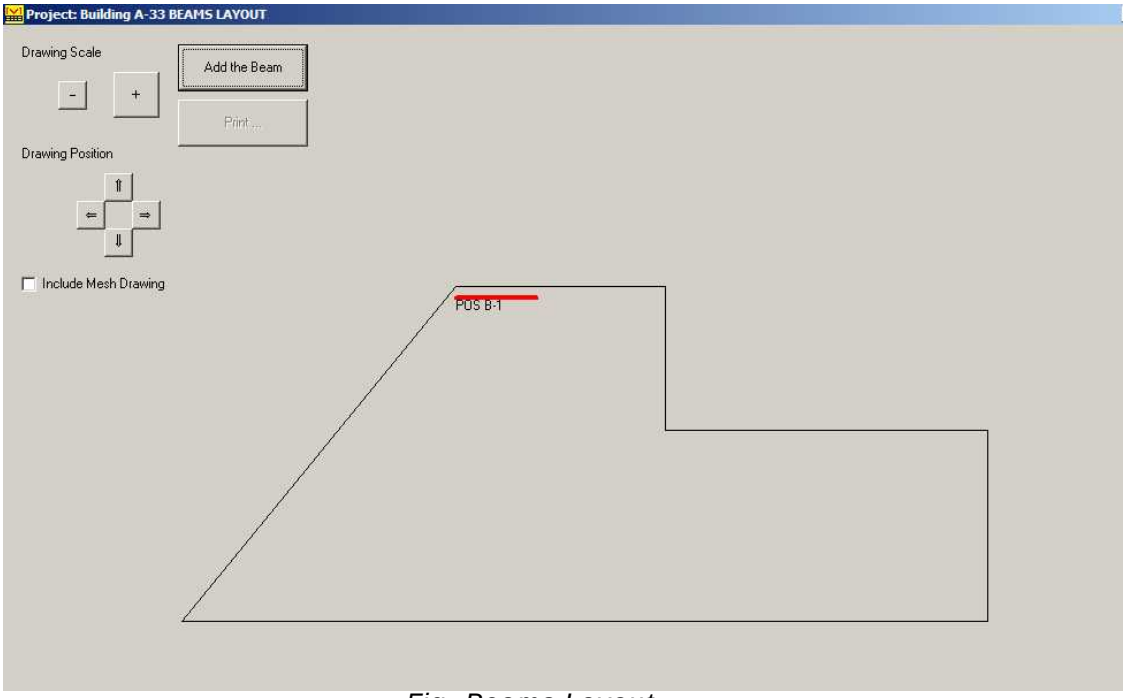


Fig. Beams Layout

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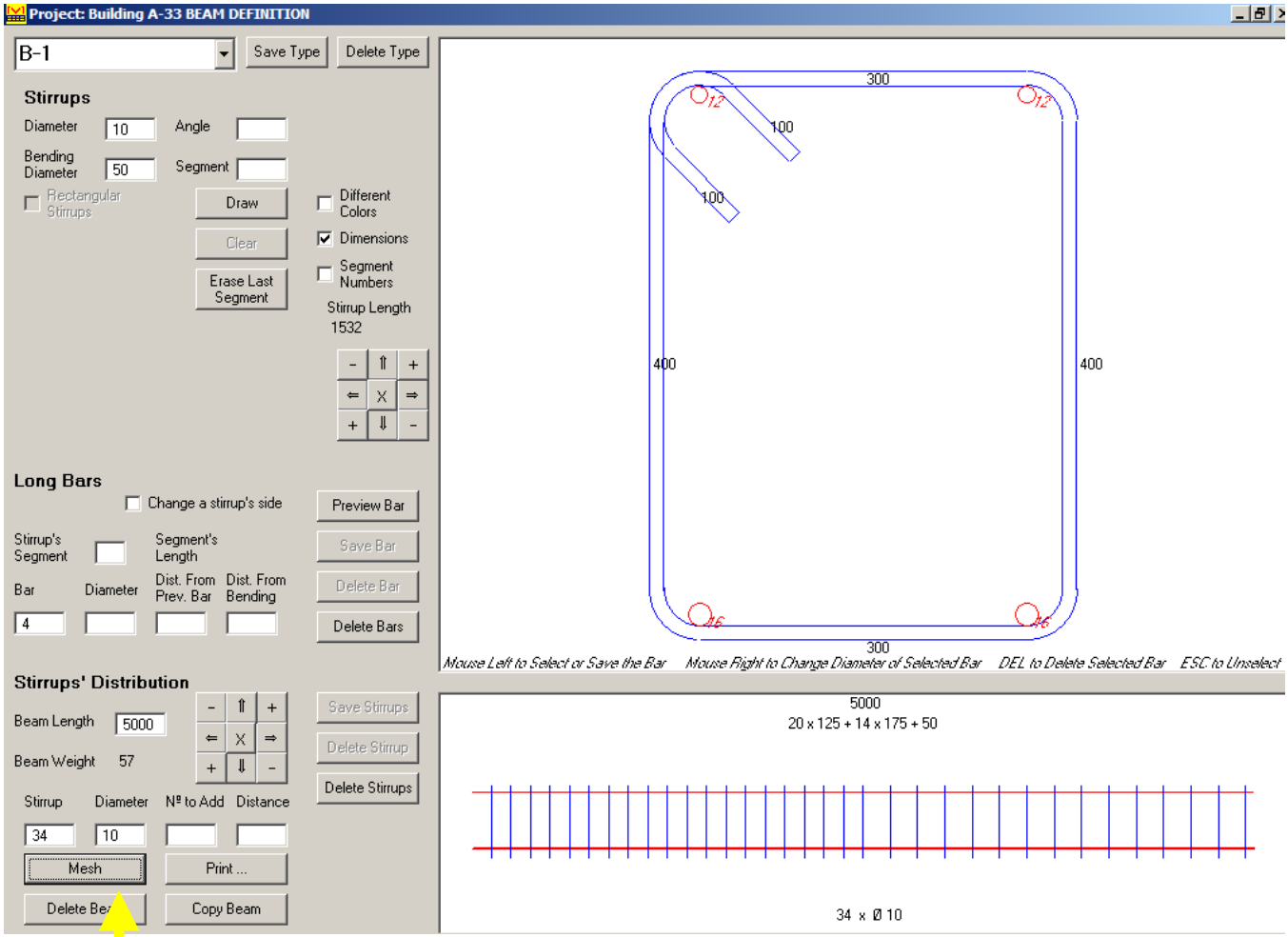
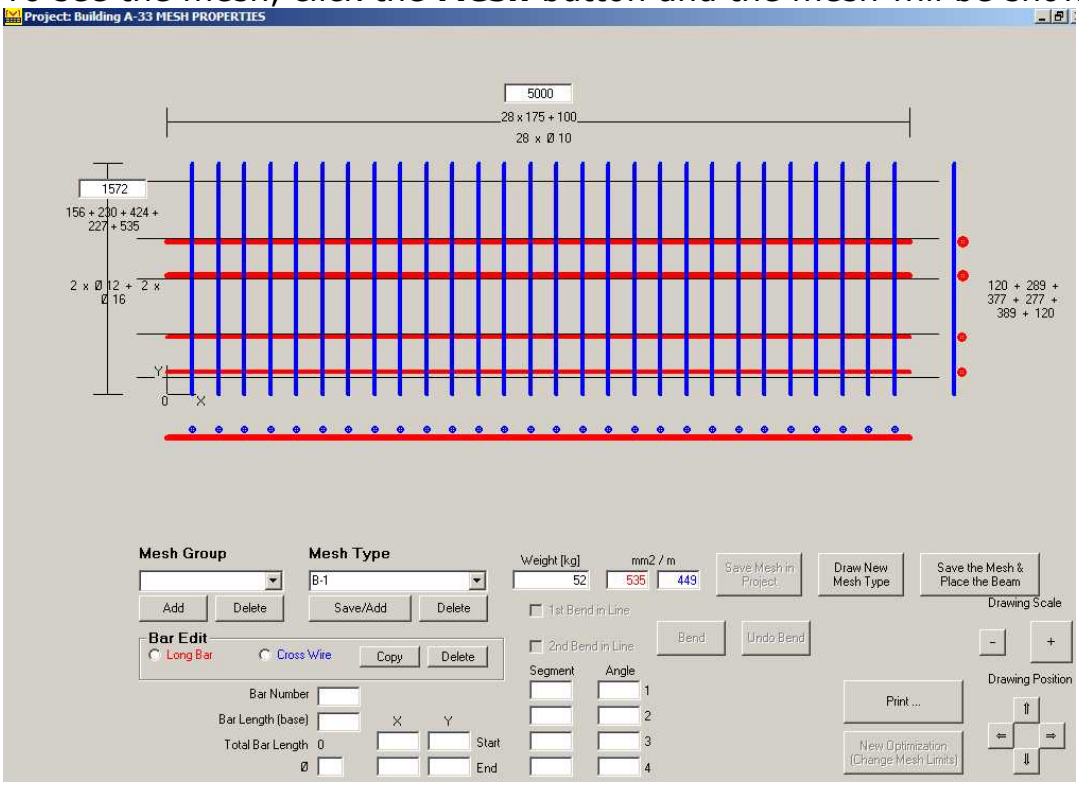
Clicking over the beam name, the beam window will be opened:



To see the mesh, click the **Mesh** button and the mesh will be shown:

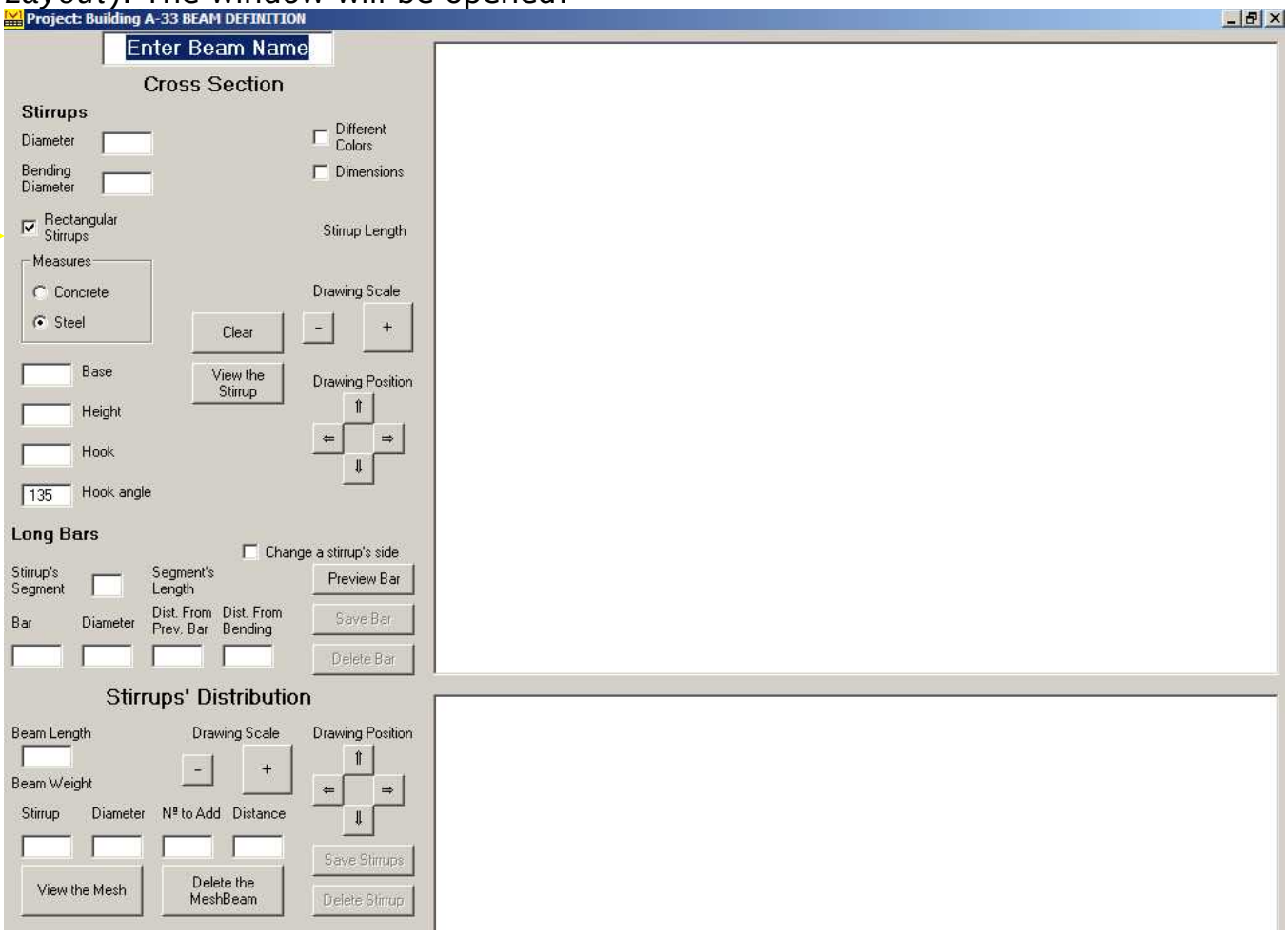


The mesh can be modified and saved as any other mesh. Also, it can be saved as a beam and placed in the corresponding zone, by pressing the **Save the Mesh & Place the Beam** button (placing the beam is equal as an additional bar placing - the moving and rotating to the final position).

The lines of the bending are the black ones (in this case 5 of them), and the distances are given on the right side of the drawing (in this case 120 + 289 + …).

a) New Beam Design

To introduce a new beam, click the **Add Beam** button (see the *fig. Beams Layout*). The window will be opened:



After entering beam name, the working stirrup diameter should be introduced. Automatically, the bending diameter is appearing. However, the bending diameter can be altered. If the **Rectangular Stirrups** box is checked, only beam base, height and hook are to be introduced:

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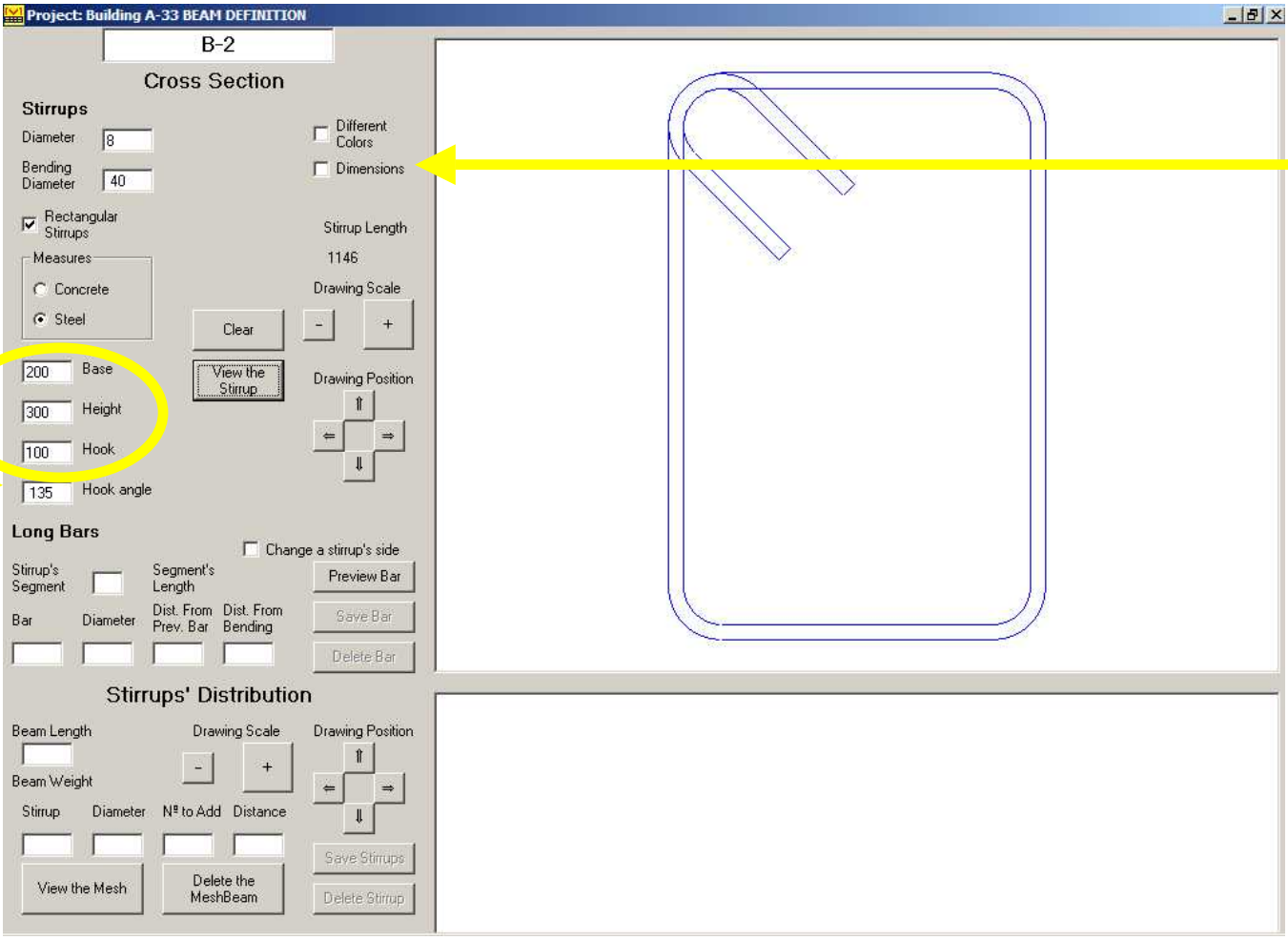
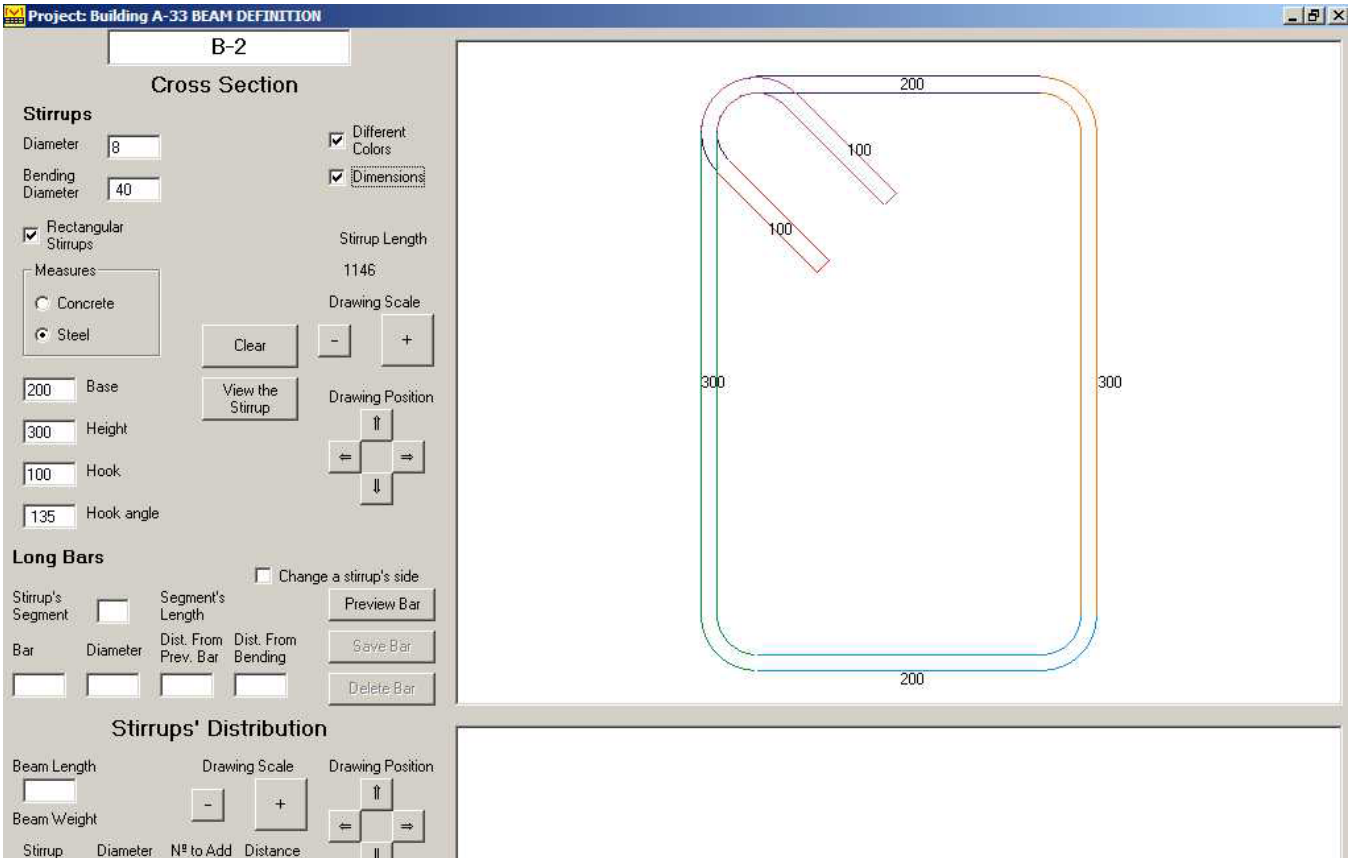


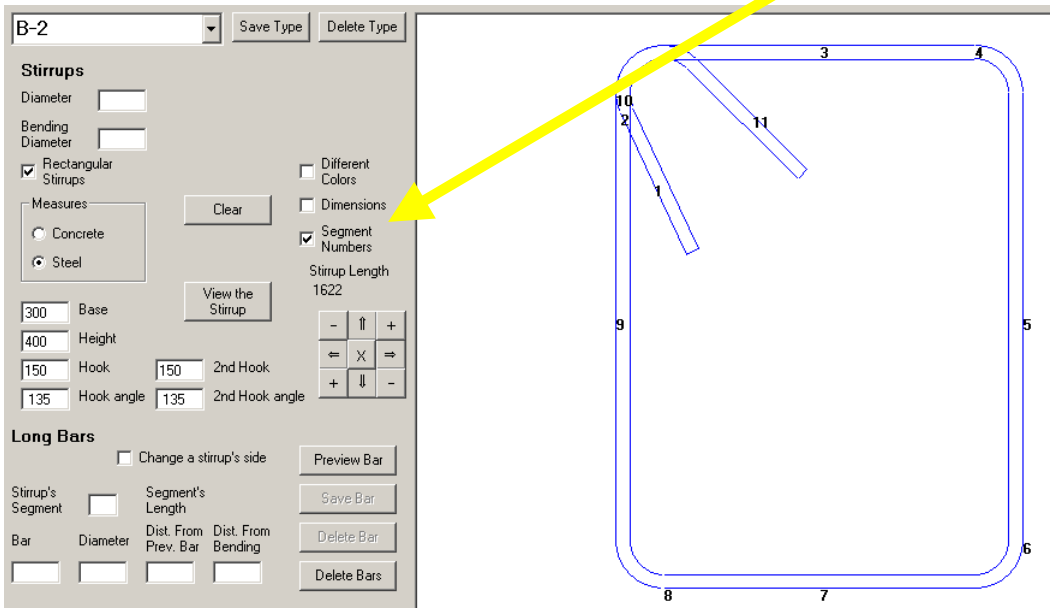
The hook angle (135º) is shown automatically. It is the same as in the previously introduced beam. Surely, it can be modified. Checking the **Different Colors** box, the stirrup segments will be colored differently, checking the **Dimensions** box, the stirrup's dimensions will be shown:



b) Long Bars introduction

b-1) Stirrup's Segments Order

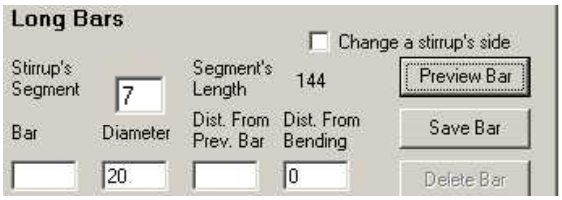
To proceed with the long bars, the stirrup's segments order will be explained. This stirrup consists of 11 segments (6 straight segments, and 5 curved segments between 2 straight ones). The segments' order is the order of bending, displayed clicking over the **Segment Numbers** box:



When the stirrup's segment is introduced (in this case, number between 1 and 11), the drawing of the corresponding part is highlighted.

b-2) Long Bar Position

The long bar can be placed on <u>any straight segment's part</u>, or in the <u>center of the curved segment</u>.



If e.g., the 7th stirrup's segment is selected, by introducing Ø20 and distance from bending=0, the bar will be shown as above. The distance from bending for each straight segment is a distance from the previous curved segment. In this case, it is a distance from a curved segment 6 on the right side. The Segment's Length is shown: 144mm (=200-40-2xØ8), so the possible long bar position from the bending is between 0 and 144mm. Pressing the **Save Bar** button, the bar will be saved.

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The bar will be colored red and the diameter will be shown.

b-3) Long Bars Introduction by Typing

To proceed introducing long bars on the same segment, type the new diameter (e.g. 16), and the distance from the previous bar (70):

(Note: only the 1st long bar of each segment must be introduced typing the distance from the bending, and not from the previous bar).

b-4) Change a Stirrup's Side

By clicking the corresponding box, the selected bar will change the stirrup's side:

b-5) Long Bars Introduction with Mouse

To select the bar, click the left mouse button over the bar diameter of any bar (segment will be detected automatically), and move the bar to the desired direction. The distance from the clicked bar (56) is shown:

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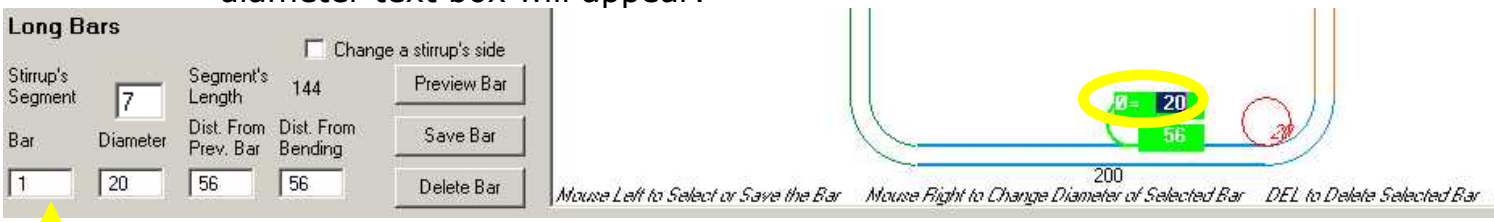
If the diameter is to be changed, click the right mouse button, and the diameter text box will appear:



Type the (new) diameter and press the ENTER to continue.

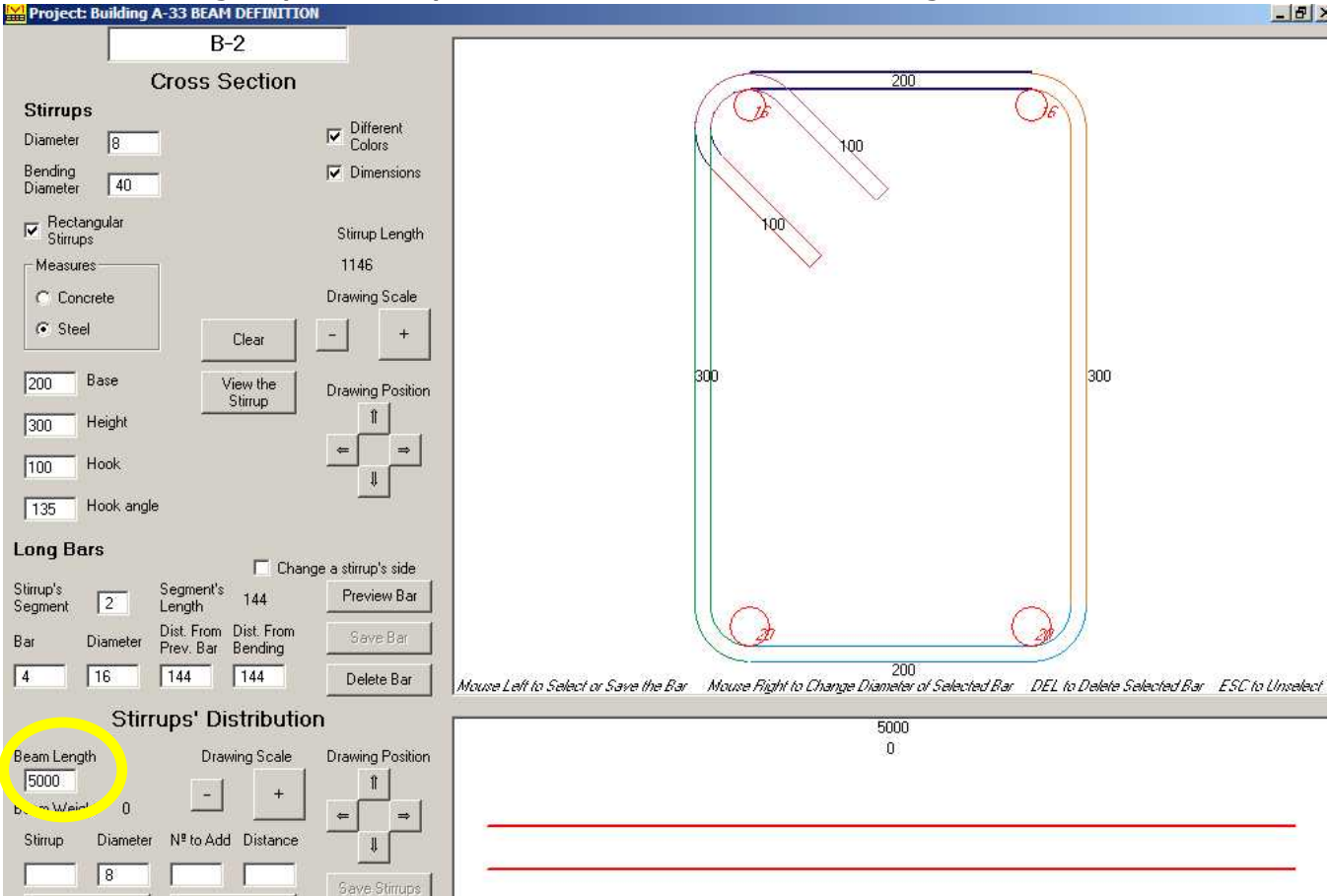
- To save the bar, press the left mouse button,
- to unselect the bar, press the ESC button,
- to delete some previously introduced bar, first select it and then press the DEL button.

All these operations can be done by typing at the left side of the window: introduce the desired bar number, and then press corresponding (e.g. **Delete Bar**) button.

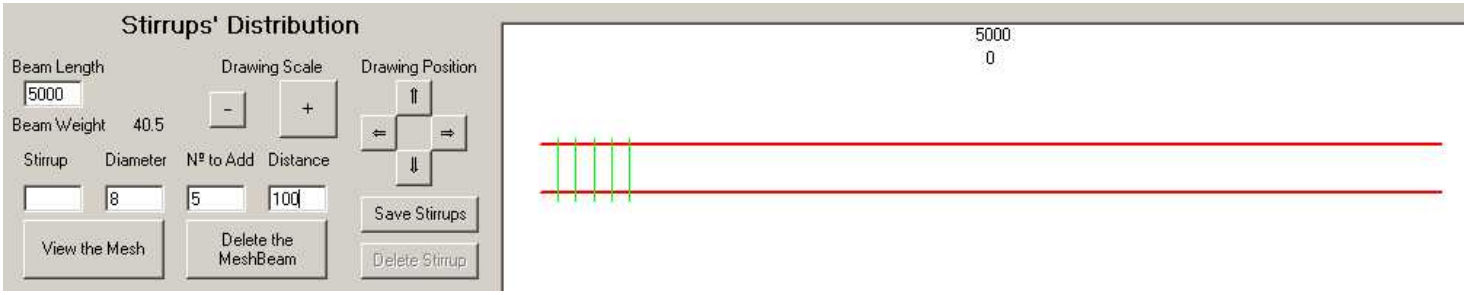
Note: long bars can be introduced with the mouse only if the box **Dimensions** is checked:

c) Stirrups' Distribution

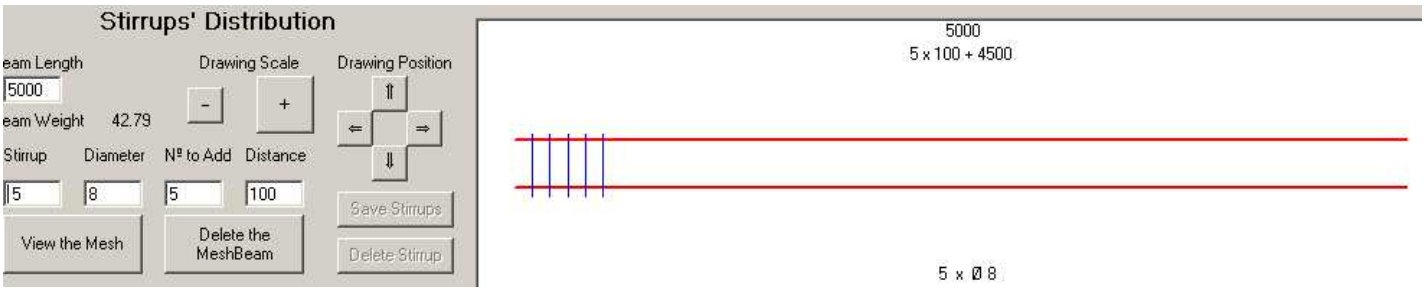
After the beam section is finished (e.g. 2Ø20 bottom layer, 2Ø16 upper layer), the beam length (5000mm) is introduced, and the drawing is shown:



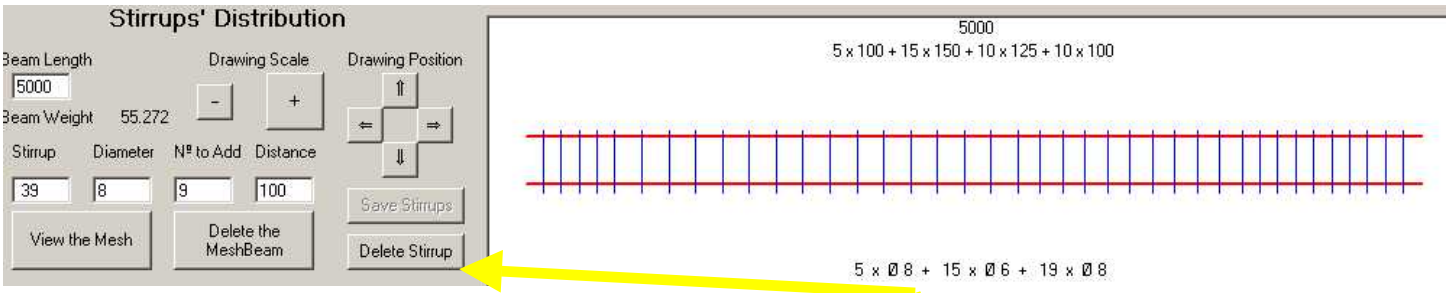
In the example, the first stirrups will be 5 Ø8/100:



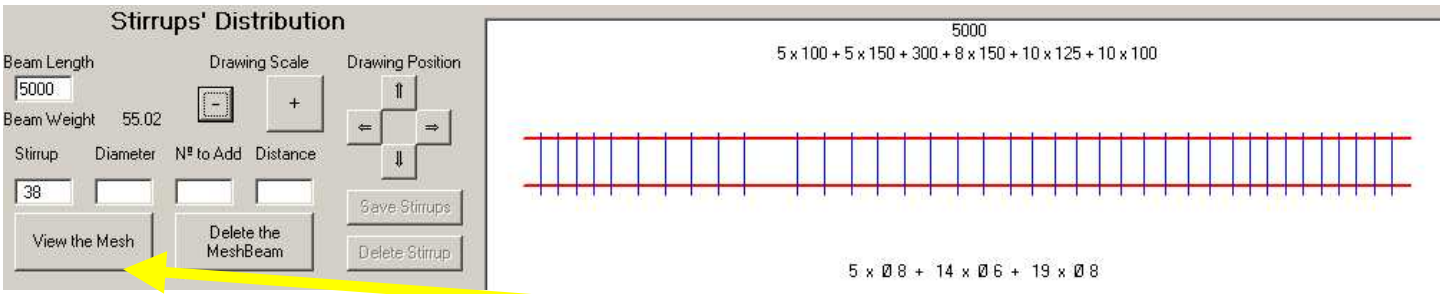
The stirrups will be shown green. If it is correct, press **Save Stirrups** button. The stirrups will be colored blue and the distances and diameters will be shown:



The same process proceeds any number of times (every stirrup can be different, on the different distance from the previous one). Repeating the above process, the stirrups' distribution will be as following:



To delete a stirrup, select it by typing its number (e.g. 11). It will be selected (colored green). If it should be deleted, press the **Delete Stirrup** button, and finally the beam will be as per below:


Stirrups' Distribution
5000
55.02
38
View the Mesh
Delete the MeshBeam
Save Stirrups
Delete Stirrup
5000
5 x 100 + 5 x 150 + 300 + 8 x 150 + 10 x 125 + 10 x 100
5 x Ø 8 + 14 x Ø 6 + 19 x Ø 8

To see the generated mesh, press the **Mesh** button, and it will be shown:

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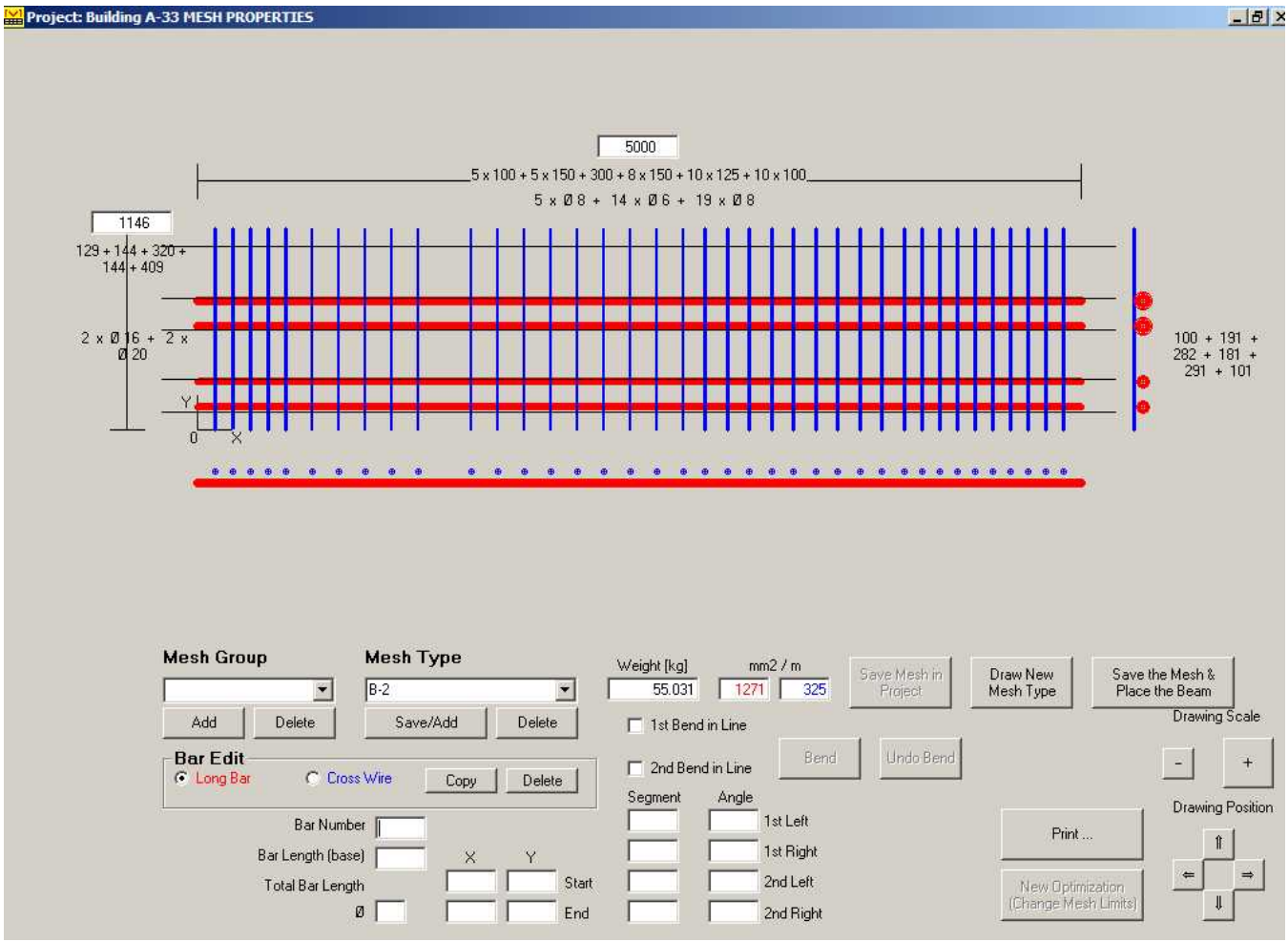
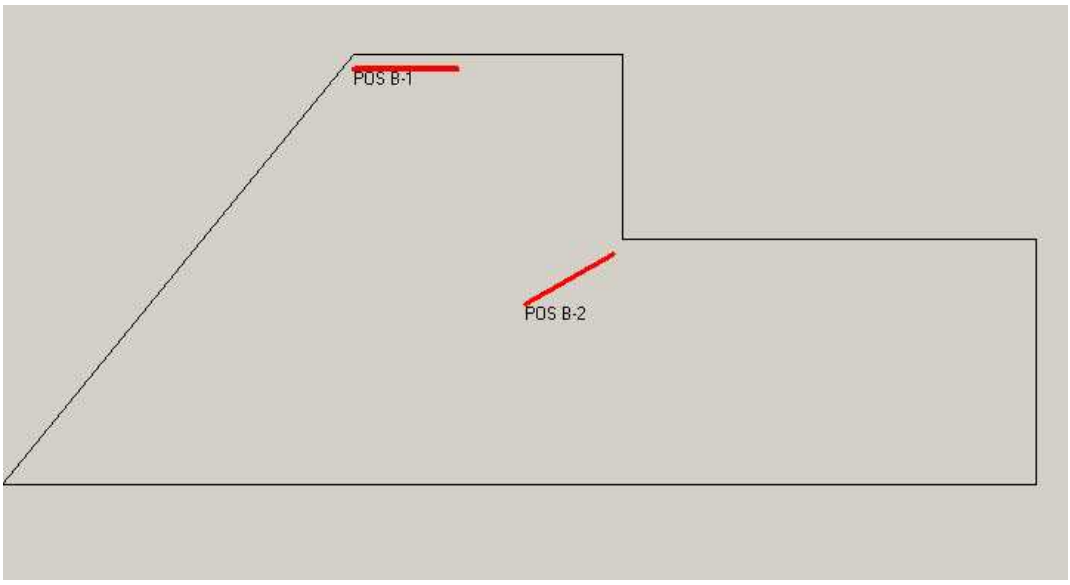


If it is necessary, the mesh can be modified, and when it is finished, by pressing the **Save the Mesh & Place the Beam** button, the layout window is opened, and the beam can be placed. In the example, the beam *B-2* will be placed (and rotated for 30º):



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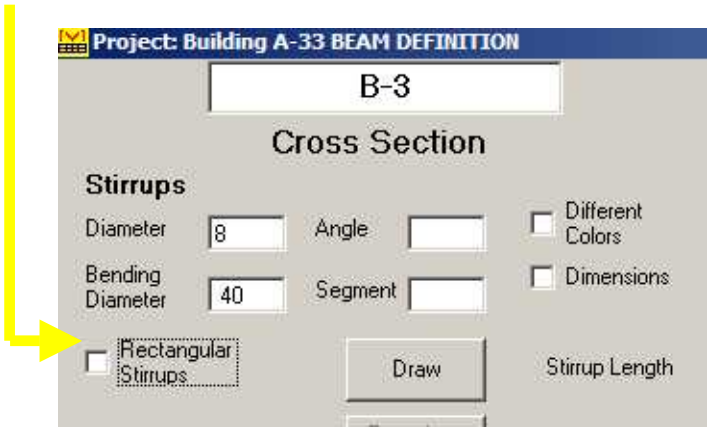
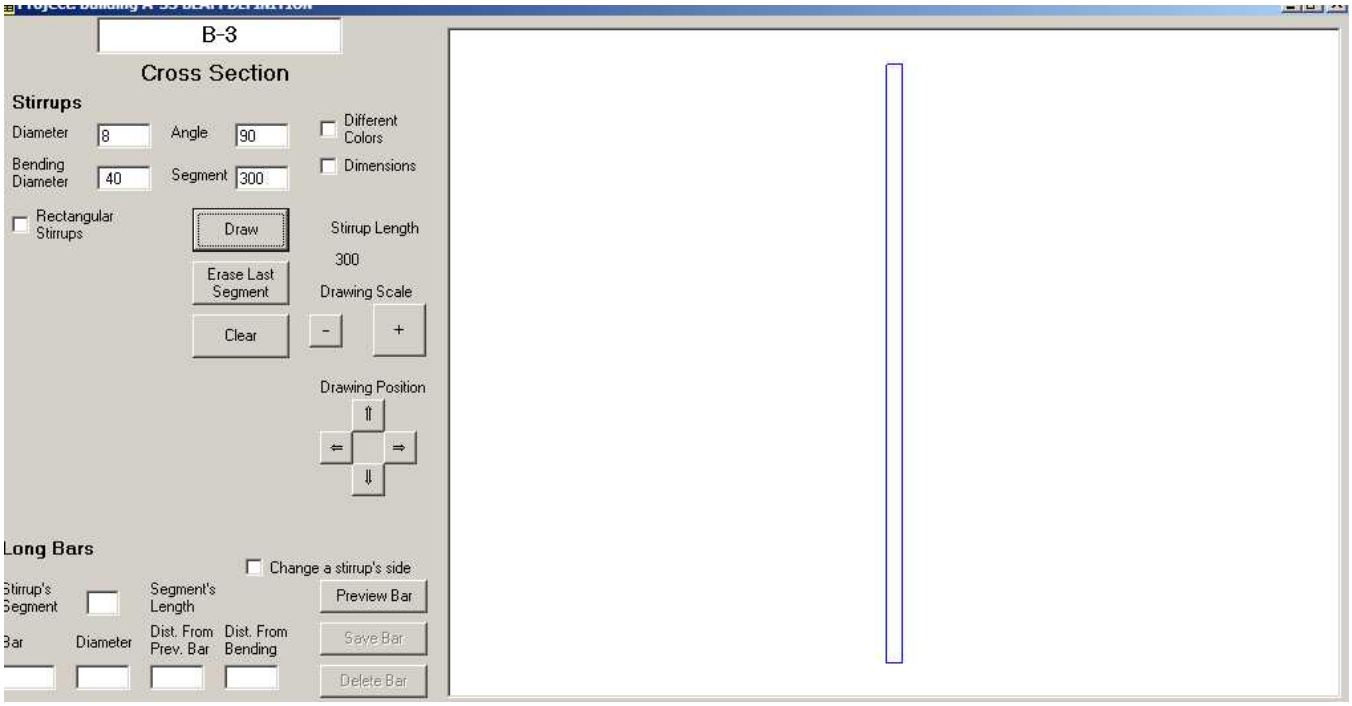
d) Non-rectangular Beam's Section

The beam's section can have any form. If it is not rectangular, the check box should be unmarked:



For every stirrup's segment, introduce the angle of bending and the segment length. Evidently, the angle for the first segment is not the angle of bending, but the angle of the rotation (position).

Starting with angle=90 and segment=300, the first stirrup's segment will be drawn:



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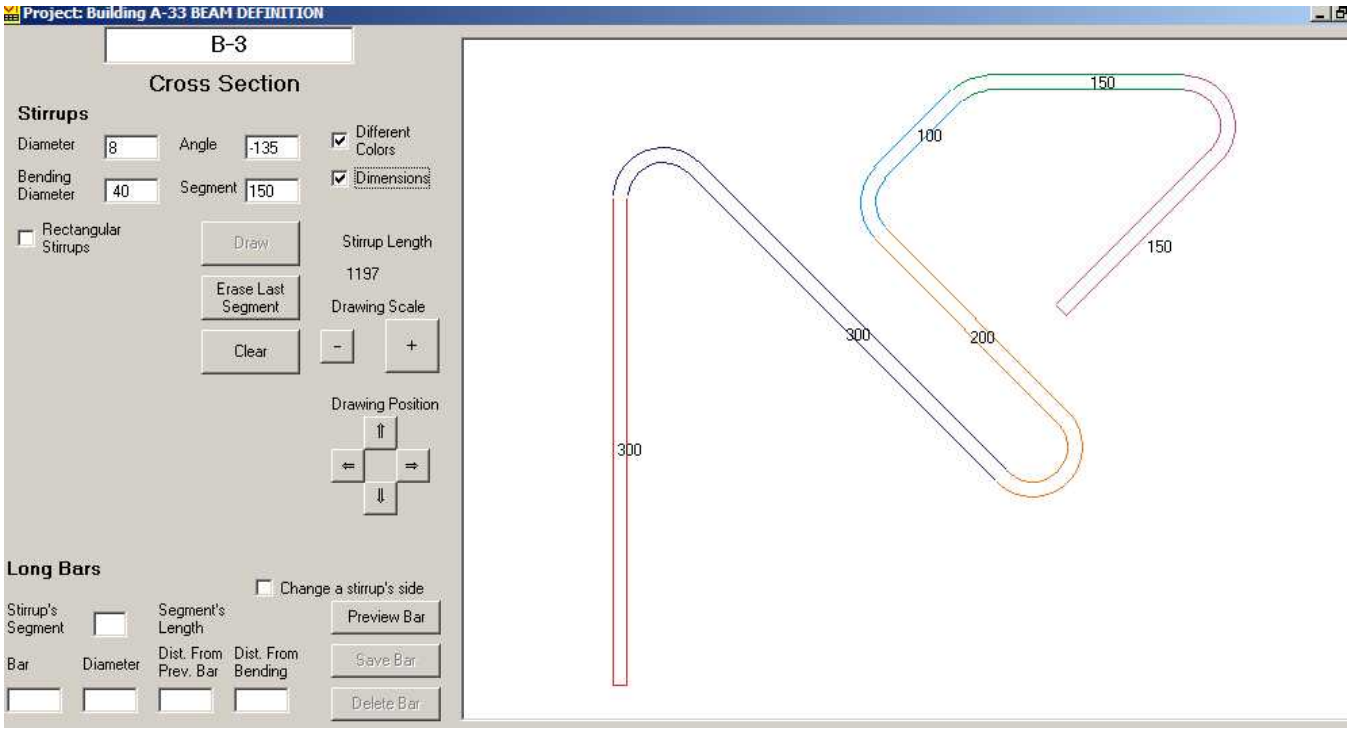
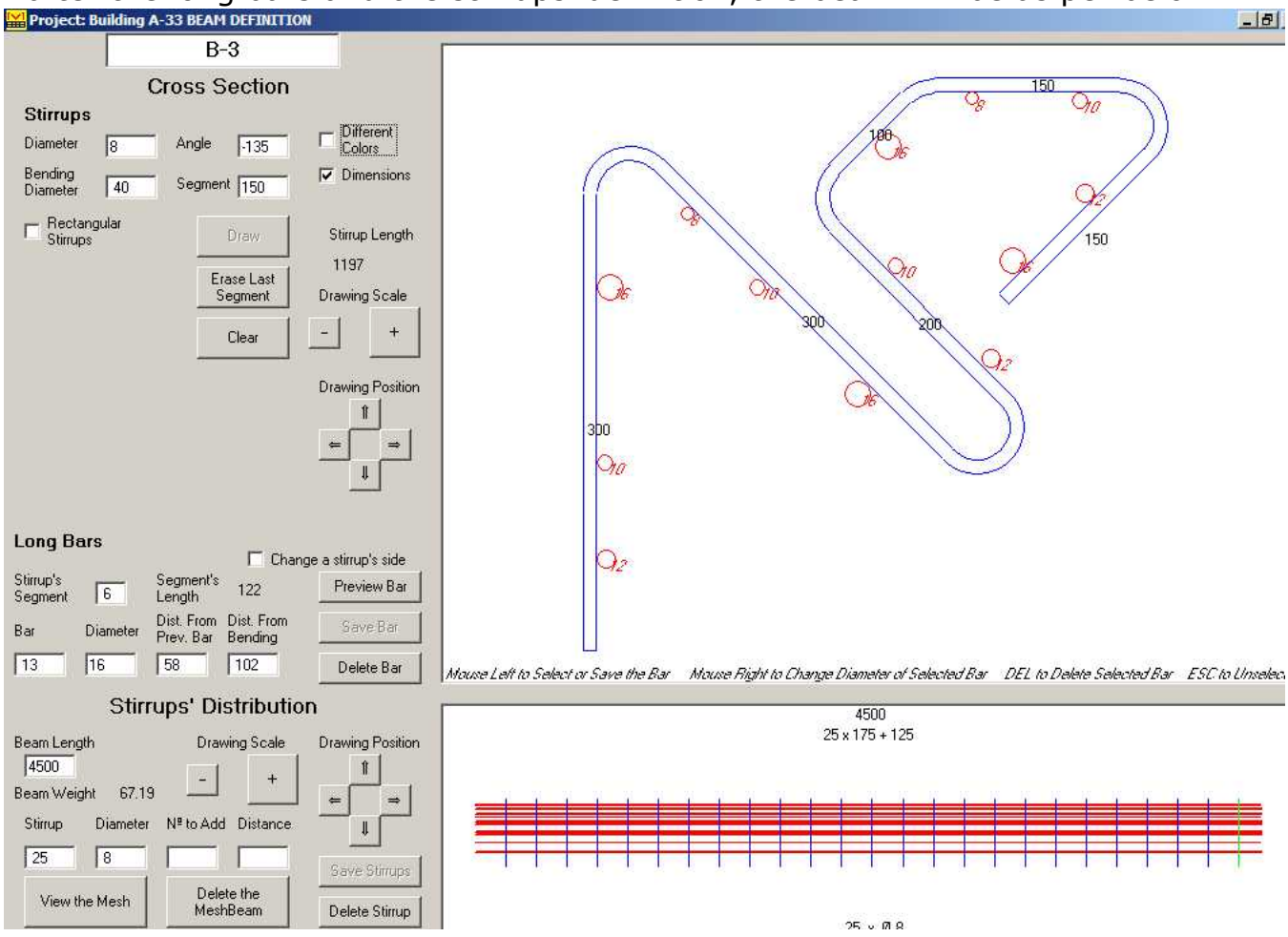
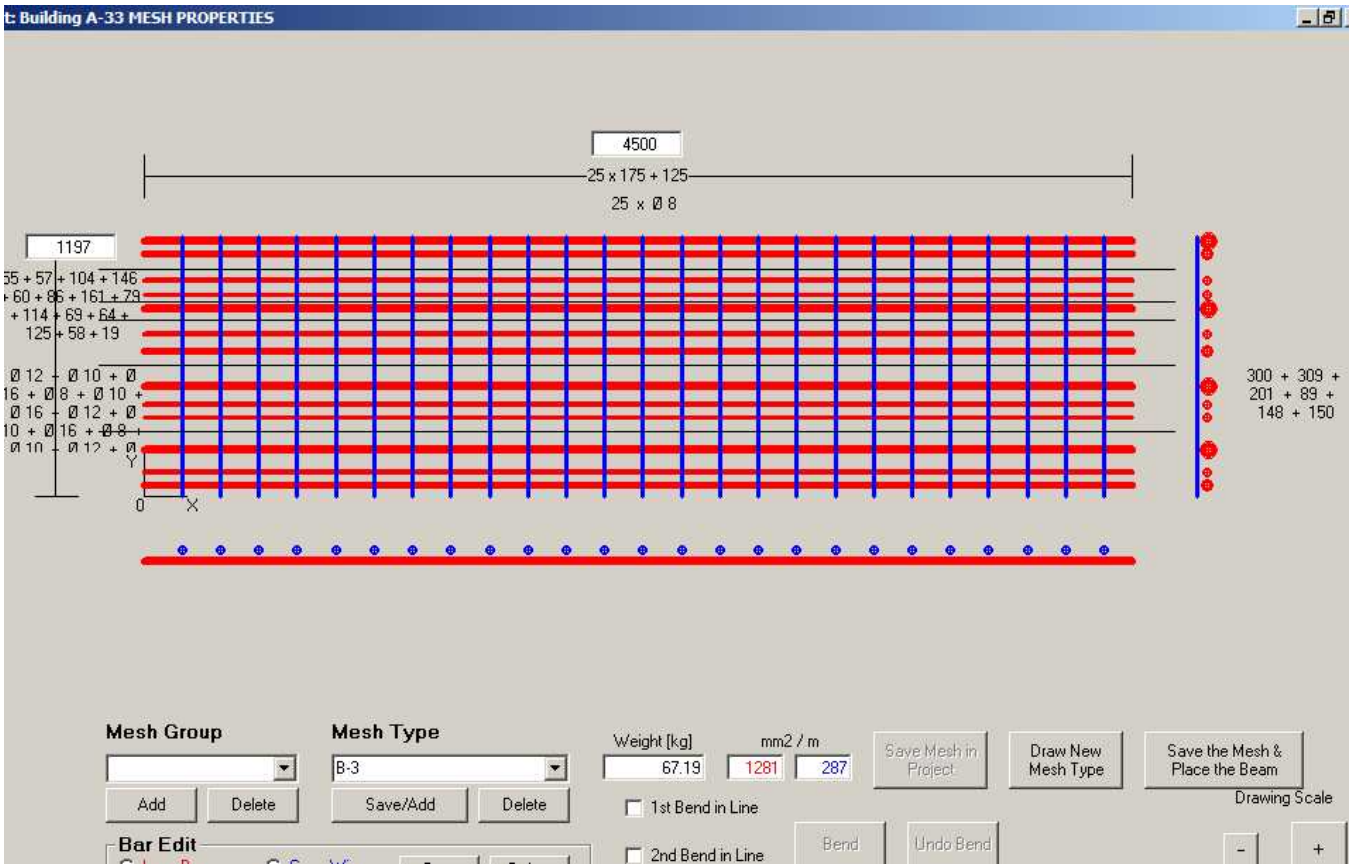
Proceeding with angle/segment = (-135/300; 180/200; -90/100; -45/150; -135/150), the "beam" section will be drawn:



The long bars definition is already shown in the rectangular beam example. So, after the long bars and the stirrups' definition, the beam will be as per below:



Finally, the mesh drawing is designed:



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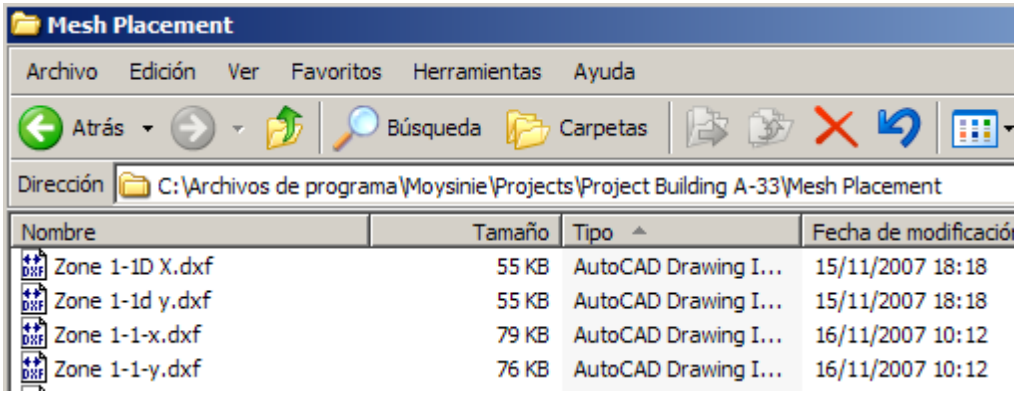
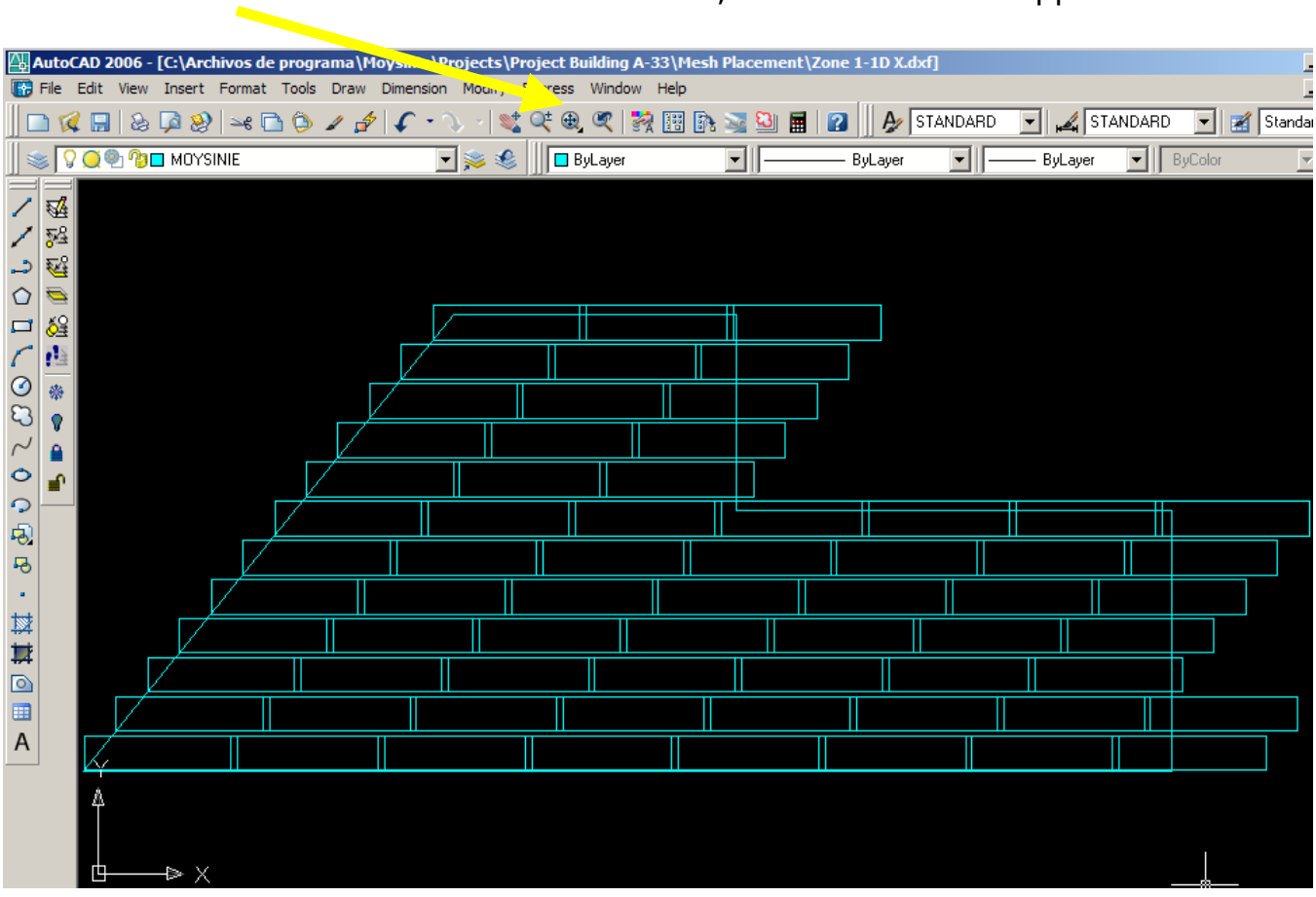
18. Creation of the *AutoCAD* Drawings

Moysinie creates the *AutoCAD* drawings (*dxf* files) of the mesh placement for all the optimized zones, and saves them in the correspondent project directory:


Mesh Placement
Archivo Edición Ver Favoritos Herramientas Ayuda
Atrás Búsqueda Carpetas
Dirección C:\Archivos de programa\Moysinie\Projects\Project Building A-33\Mesh Placement
Nombre Tamaño Tipo Fecha de modificació
Zone 1-1D X.dxf 55 KB AutoCAD Drawing I... 15/11/2007 18:18
Zone 1-1d y.dxf 55 KB AutoCAD Drawing I... 15/11/2007 18:18
Zone 1-1-x.dxf 79 KB AutoCAD Drawing I... 16/11/2007 10:12
Zone 1-1-y.dxf 76 KB AutoCAD Drawing I... 16/11/2007 10:12

Click over the desired zone, to open the *AutoCAD* drawing.
Click the **Zoom Extents** button of *AutoCAD*, and the zone will appear:



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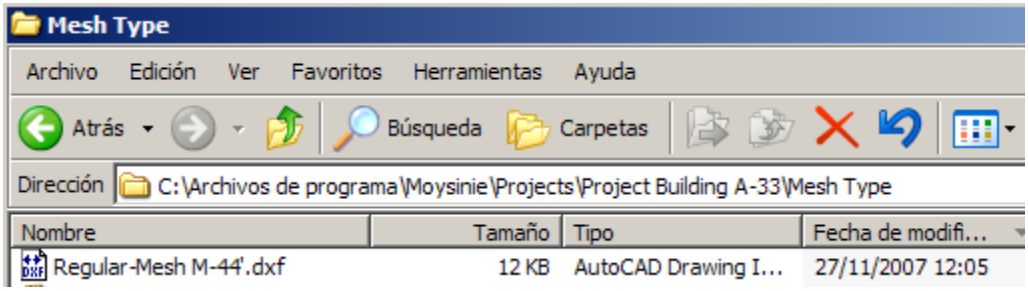
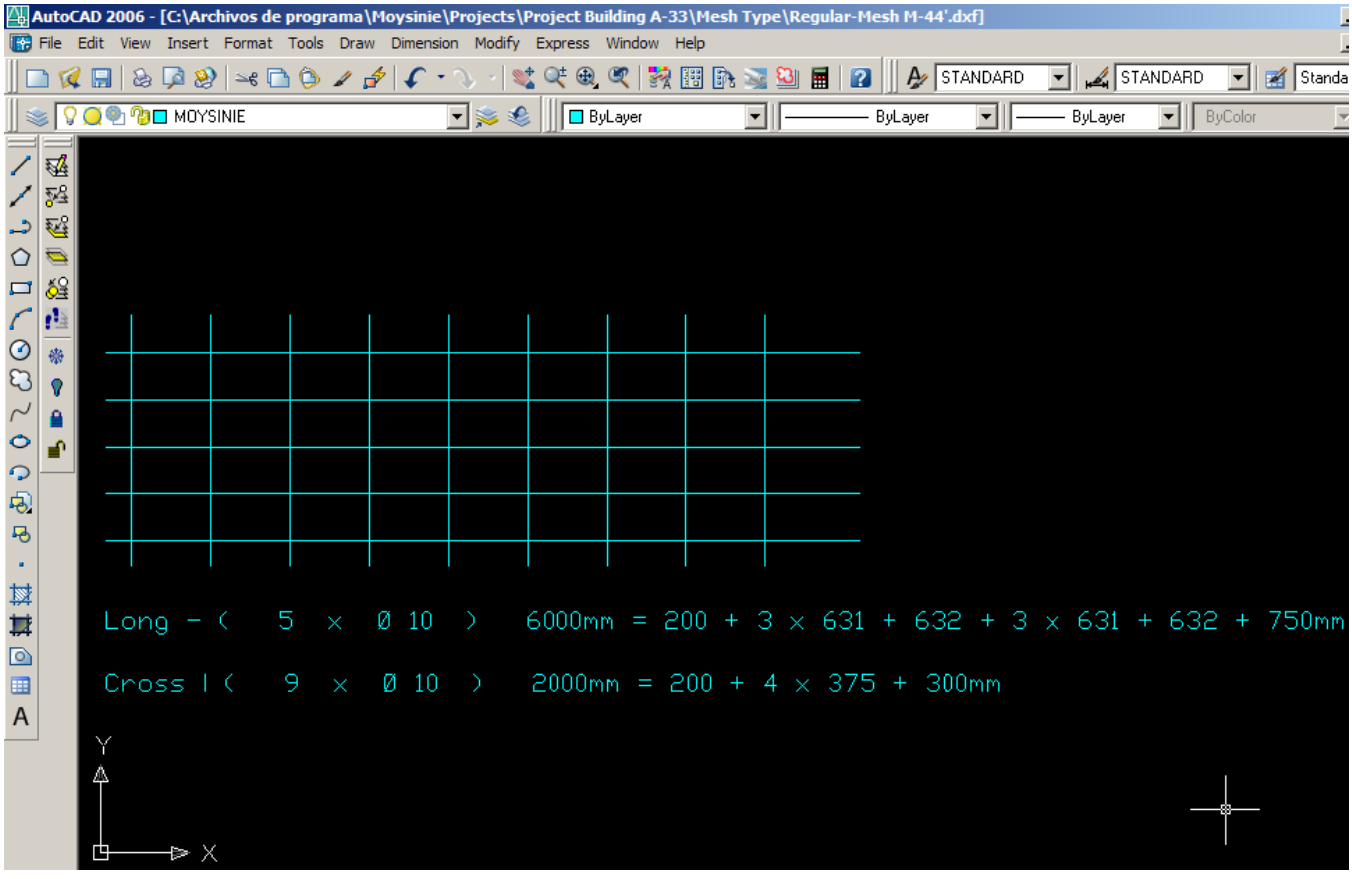
Moysinie creates the *AutoCAD* drawings of the saved mesh types, too. If the mesh has been saved within the Mesh Group (see *9. Mesh Edit*), the file *dxf* will have the name such as *GroupName-TypeName.dxf*. If the mesh has been saved as a result of the optimization process, it will be saved without the group name.




AutoCAD 2006 - [C:\Archivos de programa\Moysinie\Projects\Project Building A-33\Mesh Type\Regular-Mesh M-44'.dxf]
File Edit View Insert Format Tools Draw Dimension Modify Express Window Help
STANDARD
MOYSINIE
ByLayer
Long - (5 x Ø 10) 6000mm = 200 + 3 x 631 + 632 + 3 x 631 + 632 + 750mm
Cross | (9 x Ø 10) 2000mm = 200 + 4 x 375 + 300mm
Y
X

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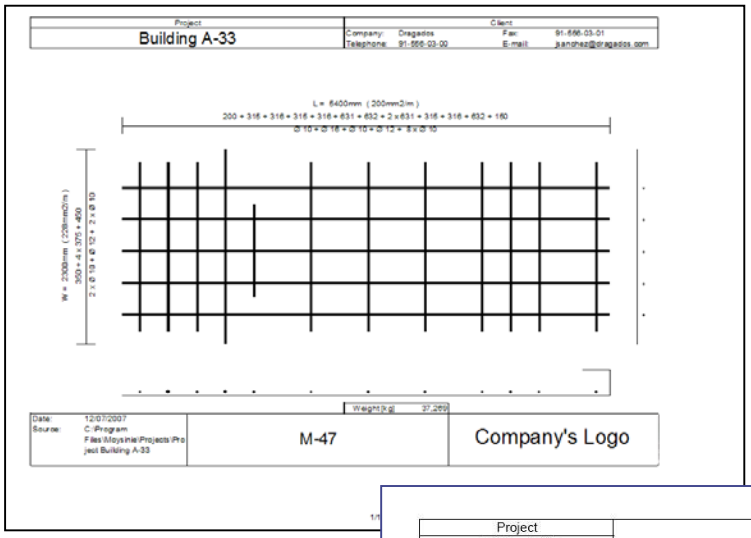
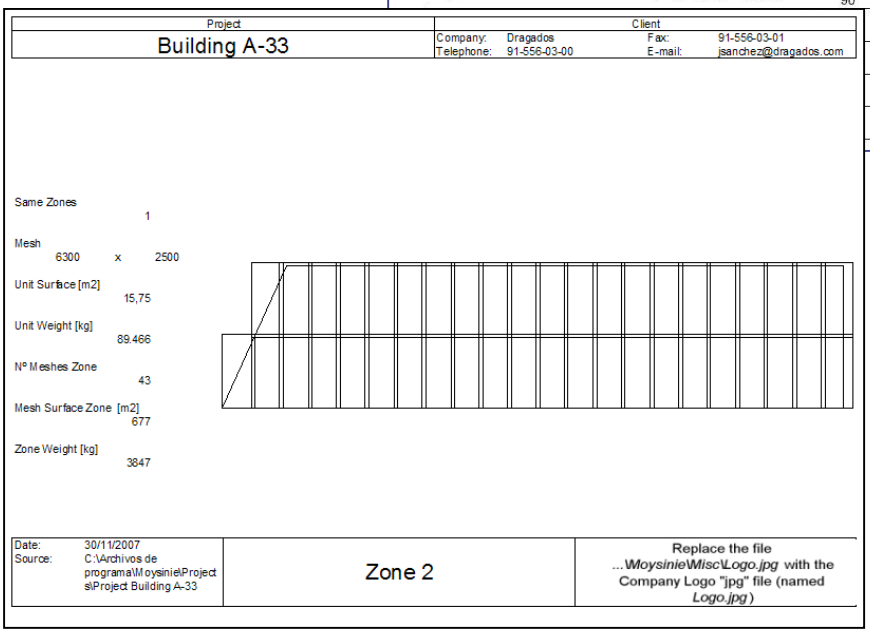
19. Results exported to *MS Excel*

All the tables and drawings can be exported to *Microsoft Excel* permitting the personal appearance of the outputs.



Project: Building A-33		Zone 1										Client: Dragados					
POS	Shape	Qty	Ø	L [mm]	[kg]	A	α	B	β	C	γ	D	δ	E	ε	F
1		1	10	6362	3,940	200	90	6000	90	200						
2		1	10	17181	10,650	200	90	17000								
A-A		1	12	10000	8,900	10000										
4		1	10	14000	8,680	14000										
5"		1	10	10000	6,200	10000										
6		1	10	7000	4,340	7000										
7		1	12	8286	7,380	200	90	8000	90	130						
8		1	10	16724	10,370	200	90	200	90	16000	90	200	90	200		
						1000	45	1000	90	1000	45	1000	90	200		
						220	10	6000	90	200	90	200				
						200	90	300	-90	200	90	500	90	400		
						200	90	700	90	200	90	200				
						1300		200								



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